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"It's the Twisted Teeth that LOCK"

about Shakeproof protection and why it cuts down complaints and repair costs than anything we can say. See for yourself—send for testing samples today!



Send today for your free copy of this complete Shakeproof Catalog. Explains thoroughly the many advantages that Shakeproof offers—also shows new patented Shakeproof products.

SHAKEPROOF Lock Washer Company

(Division of Illinois Tool Works)
2505 N. Keeler Ave.

Chicago, Ill.



Type 12
Internal



Type 11.
External



Type 15.
Countersunk



Type 20. Locking
Terminals

U. S. Pat. 1,419,564—1,604,122—1,697,464—1,782,387—Other Pat. Pending—Foreign Pat.

September 16, 1933

AUTOMOTIVE INDUSTRIES

AUTOMOBILE

Reg. U. S. Pat. Off.



Volume 69

Number 12

JULIAN CHASE, Directing Editor

DON BLANCHARD, Editor
P. M. HELDT, Engineering Editor
JOSEPH GESCHELIN, Eng. Editor

JEROME H. FARRIS, Ass't Editor
ATHEL F. DENHAM, Field Editor
GEOFFREY GRIER, Art Editor

Contents

Prices, Markets and Used Car Trading Under the Code. By Don Blanchard	323
Just Among Ourselves	325
Torsional Rigidity of Chassis Essential to Stable Steering Even with Independent Wheel Suspension	326
Oil Oxidation Initiates Sludge Formation	328
The Production and Testing of Hollow Steel Propellers	329
Angular Freedom Around Vertical Power Plant Axis Necessary to Smoothness	330
Production Lines	333
Airplane Engine Design Progress Expected to Double Specific Outputs	334
Low Vapor Pressure and High Volatility Give Best Economy	337
Treiber Gives Details on Design of Hercules Diesel	338
Two Stage Engines for High Output	339
New L-Head Diesel Has Only One Valve per Cylinder	340
Coordination Badly Needed to Avoid Hazards of Conflicting Codes	342
New Machine for Quick Test of Extreme Pressure Lubricants	343
News of the Industry	344
Business in Brief	346
Automotive Oddities	351
Calendar of Coming Events	352
Advertisers Index	43

Automotive Industries is published every Saturday by

CHILTON COMPANY

Chestnut and 56th Streets, Philadelphia, Pa.

C. A. MUSSelman, President and General Manager
J. S. HILDRETH, Vice-Pres. and Director of Sales
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Automotive Industries

AUTOMOTIVE INDUSTRIES

Vol. 69, No. 12

• THIRTY-FIFTH YEAR

• September 16, 1933

Prices, Markets and Used Car Trading Under the Code

In the face of the price increases with which the public may conceivably be confronted in 1934, it is natural that questions should arise as to the effects on sales of a sharp upward movement in prices in the near future. The industry, of course, is hopeful that the revival in business which it has been enjoying in the lower price ranges will continue and that it will spread to other price classes. This would enable it to offset some, at least, of the increase in its costs by a reduction in overhead per unit. Whether its hopes will be realized depends on the unpredictable reaction of the public to higher price levels which in turn will be determined largely by whatever expansion in purchasing power and growth in confidence takes place in the months to come.

Some increase in automotive prices was justified even before the new deal became effective, and now that it is in force even larger increases are in order to cover higher costs. On the other hand, an upward readjustment as great as is within the range of possibilities

might react so seriously on buying as to decelerate the present up-swing in sales to an extent that would affect both earnings and employment adversely.

It is entirely possible that new cars next year will cost the public 15 to 20 per cent more than at present owing to the combined effects of higher production costs and lower used car allowances. Even with these increases, volume will have to be maintained in the low-priced field and expanded in the medium and high-priced mar-

kets if the higher prices are to prove compensatory to the manufacturer. Obviously the current of recovery must run strong in the immediate future if these conditions are to be realized.

The most important element in the increased prices which the public will face on next year's models is quite likely to be the result of reduced allowances which dealers plan to make on used cars. The code filed by the National Automobile Dealers Association provides that the top allowance shall be the average market price for the particular car less 20 per cent for selling, handling and reconditioning. If this provision is approved by NRA following the hearing scheduled for Sept. 18, it will mean an increase in the effective price paid by the public of approximately 10 per cent, if not more.

In arriving at this estimate of the influence of lower allowances under the code on effective new car

TRADING allowances under the N.A.D.A. code, if approved by NRA, will set up automatically an increase of about 10 per cent in the effective price of new cars.

by Don Blanchard
Editor, Automotive Industries

E

VEN with increases of 15 to 20 per cent in effective new car prices due to the effects of higher production costs under the manufacturers' code and lower used car allowances under the dealers' code, volume will have to be maintained in the low priced field and expanded in the medium and high priced fields if the higher prices are to be compensatory to the manufacturer.

prices, it was assumed conservatively that (1) used car sales in dollars average 50 per cent of the dealers' new car sales, and (2) that dealers have been trading on a break-even basis. It is well known that they haven't. Under these conditions the code would result in a 20 per cent reduction in used car allowances which would translate itself into the equivalent of 10 per cent of the new car price. In other words, under the N.A.D.A. code, if approved, the effect will be exactly the same as a 10 per cent increase in list prices so far as the amount of money put up by the buyer with a used car to trade is concerned.

This rough estimate of the influence of the N.A.D.A. used car proposals on effective new car prices is not made with any inference that the 20 per cent margin is exorbitant. Any one at all familiar with conditions in the dealer field in recent years knows that their margins of gross profit salvaged after used car gross loss have been inadequate and that some increase in such margins is entirely justi-

fied, particularly in view of the increased costs the dealers are imposing upon themselves in the wage and hour sections of the code. Whether the 20 per cent margin is too much, or too little, or just right, presumably will be determined at the hearing. At that time the dealers undoubtedly will present data supporting their figure. Despite the reasonableness of increased gross margins for dealers, however, the higher effective new car prices which these larger margins will produce are a factor of such great importance that they cannot be neglected if a realistic view of the situation is to be taken.

If the 20 per cent margin secures NRA approval and the dealers are successful in making it stick in practice, it should make it possible for used car operations to stand on their own feet—something they have not done since the war era, when new car production fell far short of demand. In that event, some revision in new car discounts may be in order, as there will then be no reason for the cushion now commonly included in the new car discount to help out on used car losses. Such revision would be of some assistance in holding down list prices, as it would offset some of the increase in the net factory price.

In view of this increase in the

effective price which will result from whatever solution NRA approves for the used car problem, the tendency among car manufacturers will be even stronger than it might otherwise be to minimize any increase in prices based on prospective higher costs. How far they can go in this direction and keep prices compensatory presents one of the most difficult questions the industry has ever been called upon to answer.

Fortunately, by the time most manufacturers have to answer this question, more definite information will be available on a number of items of cost. It should be possible to estimate by then the effect of code participation on direct labor costs. The effects on prices of materials purchased from other industries operating under codes should also be more definitely ascertainable. The parts price situation should also be clarified and incidentally it should be stated that the parts makers' price problems are no less complicated than those of the car makers.

The question of volume, however, will still remain unanswered and consequently whether 1934 prices, as established initially, will prove to be compensatory, will depend to a considerable extent on how successful the industry's leaders are in forecasting the sales trend. In view, however, of the industry's traditional policy of looking for profits through larger volume and lower prices, rather than from larger profit margins per unit, it seems probable that an optimistic view will be taken of the sales outlook in setting prices. For the sake of the industry's workers and stockholders, it is to be hoped that such optimism will be rewarded by a steadily expanding market in 1934—by an accelerated release of the pent up reservoir of demand for automotive products which has accumulated during the depression years.

What Automobiles Cost in Commodities (Wholesale Prices)

*The composite car price is the arithmetical average of the list prices of the Chevrolet Master, Essex 6 and 8, Ford, Plymouth and DeSoto standard four-door sedans.

	January, 1929	January, 1930	January, 1931	January, 1932	January, 1933	February	March	April	May	June	July	August
Composite car price*	\$735	\$736	\$737	\$707	\$626	\$626	\$621	\$611	\$605	\$600	\$600	\$600
Pounds of beef.....	5,750	5,730	7,525	9,900	12,500	12,500	11,600	12,100	10,400	10,100	9,230	9,675
Pounds of pork.....	8,160	7,660	9,580	17,450	20,200	17,400	15,920	16,500	12,000	13,200	13,000	15,200
Bushels of corn.....	785	846	1,100	1,885	2,610	2,580	2,300	1,850	1,320	1,395	956	1,250
Bushels of wheat (No. 2 Red Winter)	530	589	840	1,270	1,310	1,240	1,095	915	752	795	534	690
Tons of coal (P'gh).	433	526	546	589	696	696	690	678	673	667	667	480
Pounds of cotton....	3,800	4,315	7,580	10,750	10,450	10,550	9,130	9,280	7,020	6,780	5,260	6,920

JUST AMONG OURSELVES

A New Form of Bootlegging

JUST when the "bootleg-car" arguments of yesteryear seemed to have died down and factory participations in non-dealer bargain sales had been brought under control, another version of this same disease started to crop up—and hasn't been entirely licked yet.

The high freight rate to the Pacific Coast makes it possible to drive cars from the middle West to the Coast for something like one-third to one-half of the freight cost.

Some factories have been doing just this thing, as a matter of fact, advertising the cars frankly as caravan cars when sold by their Coast dealers and giving the public the benefit of the reduced delivered price thus made possible.

No logical objection can be raised to such factory-sponsored driveaways because the public is given the full facts when the cars are sold to them. That the public thinks the price reduction worth while, even though the cars have been driven across half the continent is evidenced by the fact that 90 per cent of the Los Angeles retail sales of one company is comprised of caravan cars—so advertised and so sold.

This high freight differential, however, has paved the way for unscrupulous operations of benefit to nobody except those par-

ticipating in them. Independent operators have been buying cars from Mid-Western dealers at a slight advance over the wholesale price, driving them to the coast and then disposing of them there in competition with the local dealers who have to sell their factory-bought cars at the cost plus freight rate price. Active efforts to check such sales are being made, so that it would appear as though this new excrescence of automobile merchandising may be well licked before very long. The only thing that finally will lick it, however, in our opinion, is lower freight rates to the Pacific Coast.

* * *

Maybe It's the Breakfast?

ARE factory sales meetings getting serious and snappy! No sooner had we printed the recent item indicating that they are—and should be—than we ran into a shining example in the series of gatherings for dealer salesmen that Harry Moock, Plymouth's ever-dynamic sales manager has been holding in various parts of the country.

No quiet midday luncheons are these sessions. At 8:30 a. m. sharp the salesmen are bid to a hearty breakfast of steak, potatoes, eggs and coffee. In half an hour the meal is finished and Mr. Moock starts his program—an intimate, practical talk on speci-

fic retail sales problems. Inside of forty-five minutes the whole thing is over and the salesmen still have plenty of time to make their morning calls.

Do they like this type of meeting? Well, requests for repeats are coming in consistently. . . . Maybe there is something potent in the inspiration of seeing a factory executive working full blast at 8:30 a. m. when he is away from his home office!

* * *

Minimum Wage vs. Drawing Account

AGUARANTEED minimum drawing account for automobile salesmen is one of the provisions in the retail code being proposed by the N.A.D.A.

The chief sales executive of a big passenger car factory told us the other day that he thinks every retail salesman should be guaranteed a minimum salary. By no other means, he says, can we expect to improve the caliber of men.

"But, 'he said,' a guaranteed drawing account in my opinion is almost worse than nothing. A drawing account encourages a dealer to keep a poor salesman longer than he should in the hope that eventually the salesman may have a run of luck and be able to make up what he owes the dealer on the drawing account."

"It encourages the salesman who has had a temporary setback to quit his present job and take another where he can start clean again. It promotes instead of discouraging turnover among salesmen."

"The dealer ought to guarantee every salesman in his employ a minimum wage!"—N.G.S.

Torsional Rigidity of Chassis Steering Even With Independent

A COMPREHENSIVE discussion of the general subject of independent springing was presented by the representative of the French Society of Automobile Engineers at the Congress, Georges Broulhiet, whose paper was entitled "Independent Springing, Its Effects on Suspension, Steering and Road-Holding Qualities." It appears that M. Broulhiet has given much thought to the subject and has acted as consultant to both Peugeot and the Citroen in developing models embodying this feature.

The author prefers the term "composite front axle" to what is generally called (erroneously, he says) independent suspension of front wheels. He holds that it is impossible to deal with the subject of composite front axles separately, in either theory or practice, and that it must be regarded as a part of the complete problem of resonance between the road and the car as a whole. Experiments have shown that frame suspension, road-holding qualities, body vibration and vibration of the steering gear are all interdependent. Therefore, the problem of road resonance must

With the digests in this issue, Automotive Industries completes its presentation of the great array of technical papers presented at the International Automotive Engineering Congress staged in Chicago by the S.A.E. The accompanying digests in conjunction with those presented in our issues of August 26 and September 9 constitute a comprehensive report of the information presented by the speakers at the technical sessions.

be dealt with as a whole by the designer if he wishes to grasp it in its complexity and obtain the scientific background necessary for quick progress.

Two machines designed to study car vibration due to road unevennesses are described in the paper, one being designated a "qualitative" and the other a "quantitative" machine. The first serves to determine the various critical speeds at which pronounced vibrations occur, and to try means of reducing or eliminating these vibrations. The second machine serves for a further study of parts whose vibration it has proven impossible to eliminate with the aid of the first machine alone.

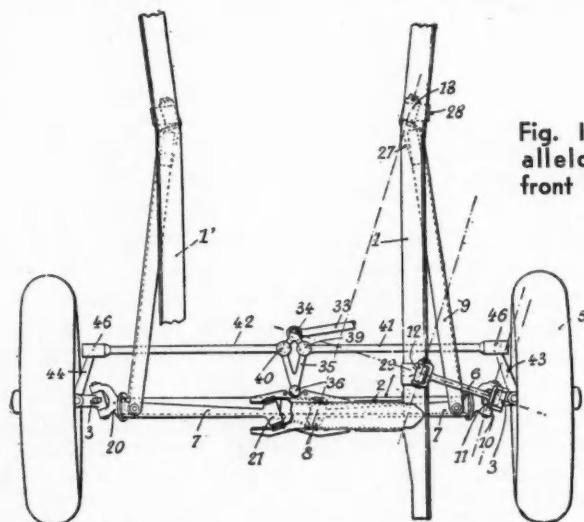


Fig. I.—Broulhiet parallelogram-type of front axle, top view.

In the first machine there is a shaft directly below the front axle of the car which carries an eccentric at each end, from which connection is made by an eccentric rod to the center of the front wheel. The eccentricity of each eccentric is 2 mm. (0.080 in.) and the two eccentrics are 180 deg. out of phase. Thus a rocking motion is imparted to the front axle of the car, the periodicity of which can be varied through a wide range, as the speed of the electrically-driven eccentric shaft can be varied between 100 and 2200 r.p.m. While the car is being subjected to the vibrating forces produced by this machine, records are made of the amplitudes of vibration of different parts, such as fenders, hood, trunk, superstructure, etc., and curves are drawn showing the relation between speed and amplitude of vibration of these parts. These curves immediately show the critical speeds, or speeds of resonance, of the different parts. Experiments with this machine showed that practically all resonance of component parts can be eliminated, usually by stiffening the part involved. The parts which it is most difficult to keep from vibrating are the fenders and the cowl.

In developing a car with the aid of this machine, comparisons are made of the vibrations of corresponding parts on different cars, the car showing the minimum vibration being taken as a model. Amplitudes of vibration are determined by means of mirrors, frequencies of vibration by means of

Essential to **S**table **W**heel **S**uspension

tuning forks, and the frequency of the exciting force is obtained directly by determining the speed of rotation of the eccentric shaft. The tests are carried out on a completely equipped car and with different numbers of passengers.

The second or quantitative machine, which serves to determine the resistance of parts to failure by vibration, imparts to the front end of the car vibration of an amplitude of 1 in. and of a frequency of 600 cycles per minute. Breakages often occur quickly with this machine, usually within 20 minutes, and the results are always comparable between tests. This machine was found quite useful in determining weak points in a welded frame with box-section members and in developing the welding process in the shop.

M. Brouillet emphasizes that the torsional rigidity of the chassis assembly must be a maximum. In development work each component of the car must have its rigidity increased until vibration ceases. As the part is made more rigid its na-

tural period of vibration is raised and is finally brought outside the range of frequency of exciting forces due to road unevennesses. An exception is permissible only in the case of front fender mountings, because in this case it is easier to get out of the frequency range of exciting forces at the low-frequency end, by the use of very flexible mountings.

The translation of a good deal of this paper, unfortunately, is too literal, which makes it difficult to get the author's meaning. For instance, in one place he says "the inertia of the car must be principally localized near the front axle." Now, inertia is a property of matter which it would be difficult to localize. Probably what is meant is that there should be considerable mass at the forward end, so that the moment of inertia around the principal longitudinal axis will be great. Another somewhat puzzling passage reads as follows: "The design of springs built up on strictly arithmetical spacing has given, with ease, an accumulation

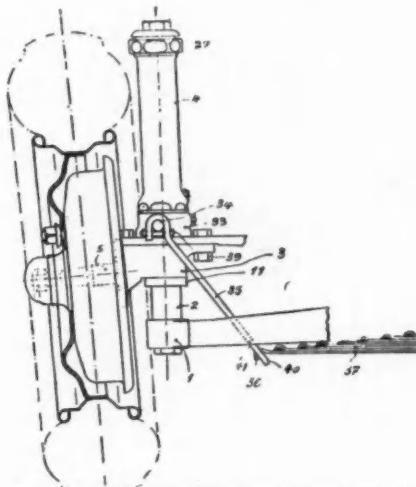


Fig. 3—Broulhiet slipper type
of front-axle end

of energy amounting to 72 lb.-ft. per lb. of ordinary spring steel." This presumably means that in carbon-steel springs designed to have a constant load/deflection ratio it has been found quite easy to store 72 ft.-lb. of energy per cu. in. of steel.

Mr. Broulhiet is strongly in favor of torsion springs for automobile chassis suspension. "Torsion springs are much lighter for the same quality of steel," he says. "Theoretically they weigh only five-twelfths as much as leaf springs, which would correspond to a weight of only 1 per

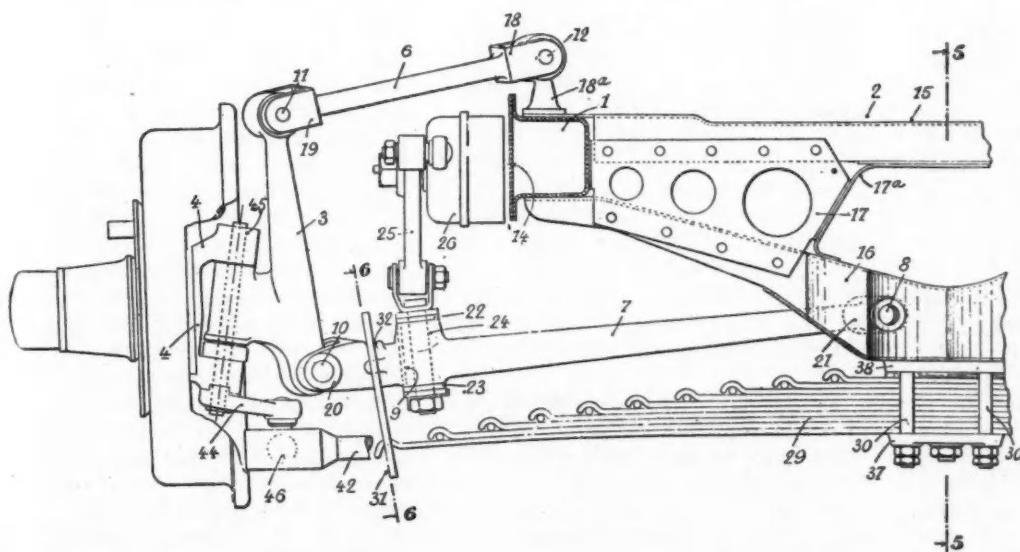


Fig. 2—Broulhiet parallelogram type of front axle. Front view

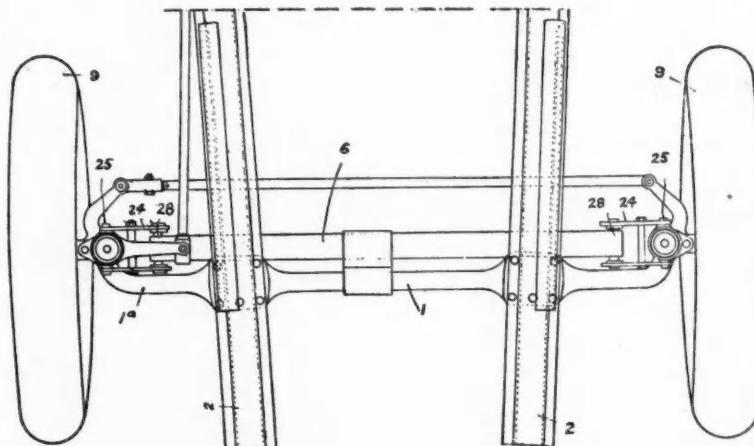


Fig. 4—Front assembly showing in plane view slipper-type front axle.

cent of the loaded vehicle. The usual type of leaf springs having a damping effect due to friction between leaves are bound to disappear."

In Appendices to the paper two types of "composite front axles" due to M. Brouliet are illustrated and briefly described. The first is known as the parallelogram type. As shown in Figs. 1 and 2, the knuckle pin is carried by a part 3 connected to the chassis frame at the top by a short link 6 and at the bottom by two links 7 and 9. The axes of all connections on one side of the chassis are parallel and slope

toward the longitudinal vertical center plane of the car. The braking couple of the front brakes is transmitted through the pin 10 which is of the same size as the knuckle pin. All other joints are Repusseau rubber Silentblocs.

The frame is mounted on a transverse spring, the ends of which connect to the lower links 7 through a simple type of shackle. This spring is of the constant-rate type and there is a roller at the end of each leaf which holds it free from the leaf below, thus preventing interleaf friction. The tie rod is in two parts which connect to a V-

shaped lever at the center of the frame. This lever has three spherical joints, the third joint being for the drag link to the steering arm. This central lever being mounted on the frame, spring action has no effect on the steering and there is no change in the toe-in. The parallelogram has been worked out by a method due to M. Julien and limits the variation in the inclination of the wheels to 55°, the variation of the track to 2 mm. and the variation of the wheelbase to a negligible magnitude. Wheel movement from the normal position is limited to 80 mm. (3.2 in.) on compression and 40 mm. (1.6 in.) on rebound.

Figs. 3 and 4 show the Brouliet slipper-type of composite front axle. The forward cross member of the frame serves as front axle and has both ends bent back in a horizontal plane, as shown. A knuckle pin is fastened in a tapered hole in each end of this member. The front-wheel spindle connects to a tubular member that slides up and down on the knuckle pin, on which it can rock around two ball bearings. Chassis suspension is through a half-elliptic cross spring, and owing to the bent shape of the cross member this spring may be placed centrally between the knuckles. The ends of the spring are connected to the tubular members by inclined double shackles attached to a thrust bearing turning on the tubular member. The transverse spring is of the same type as used with the parallelogram-type of front axle.

Oil Oxidation Initiates Sludge Formation

OXIDATION of oil is the key to the presence of sludge deposits, was the conclusion reached in a paper on the effect of sludge on engine-oil performance by D. P. Barnard, E. R. Barnard, T. H. Rogers, B. H. Shoemaker, and R. E. Wilkin, all of the research and technical staffs of the Standard Oil Company (Ind.).

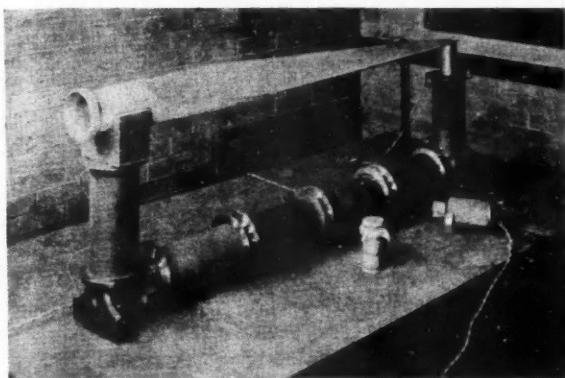
The term "sludge" has been used for years to denote virtually any deposit (except combustion-chamber carbon) found in an internal combustion engine. While it is generally understood that sludge deposits result from the deterioration of the lubricating oil, there is no uniformity in the constitution, or even in the appearance, of such accumulations. Analyses have shown compositions varying from

quite large proportions of asphaltic material, which undoubtedly did come from the oil, to almost negligible proportions of such substances, with the major part of the deposit consisting of "blow-by" carbon, inorganic material and, occasionally, water. Aside from their invariably being black, these deposits differ quite widely in appearance, the range extending from a thin, hard "lacquer" to a soft putty-like mass of considerable bulk.

Frequently deposits in the form of gelatinous masses are encountered, and, in fact, such accumulations are usually responsible for the clogging of screens and filters. In such cases the non-fluid accumulation generally consists largely of oil held in the emulsion with carbon

and inorganic material by the presence of some small amount of asphaltic matter. The results arising from the presence of these deposits are almost as varied as their consistencies, and range from accumulations in oil pans and other relatively quiet locations which, when an engine is disassembled, appear quite objectionable but which actually do no harm, to deposits in such vulnerable spots as ring grooves, oil screens, and filters, where actual interference with engine operation results. It appears reasonably certain that the key to the presence of sludge deposits—regardless of form—lies in the oxidation of the oil to give the small amounts of asphaltic substances which are invariably present in the crankcase contents.

The Production and Testing of Hollow Steel Propellers



Showing propeller blade on magnetic testing stand

In the paper on "The Manufacture and Magnetic Testing of Hollow Steel Propellers," Hamilton Foley of the Pittsburgh Screw and Bolt Corp. described the manufacturing and testing processes employed in the production of Dicks hollow steel propellers by his firm. The blades of these propellers are made of two parts welded together. One of these forms the thrust side and the other the back face and shank. Of the two, the one forming the back face is made much wider, so it includes both the leading and the trailing edge, and the welds, instead of being at the edges, are on the thrust face. The parts are made from flat plates which are first taper-milled to obtain sections that lead to uniform stress. The thickness varies from about $\frac{3}{8}$ in. to about $\frac{1}{16}$ in. Next the parts are punched out to the exact contour. Forming dies then form the parts to the correct shape of the blade sides, and one end of the thrust-side punching is forged to form the shank of the blade. The forming dies are used in a 1400-ton hydraulic press.

Welding these two stampings together is one of the major operations in the manufacture of the Dicks blade. Each of the pressings has all the spring of chrome vanadium steel, one end of each is only $\frac{1}{16}$ in. thick, the other end close to $\frac{3}{8}$ in.; both have and must retain the curvature of one of the

sides or faces of a scientifically designed propeller.

All welding is done by the atomic hydrogen process. Special fixtures hold the two pressings while they are being welded, so that the required pitch and blade form are maintained. The welded product is immediately heated in an electric furnace to 1700 deg. F. to remove all welding strains. The hub or shank end of the blade is then forged and the blade rough-finished.

These propeller blades are made of electric-furnace chrome-vanadium steel of the following composition: Carbon, 0.28-0.32; manganese, 0.50-0.80; silicon, 0.30-0.36; sulfur, 0.18; phosphorus, 0.17; chromium, 0.80-1.00; vanadium, 0.18-0.25 (or molybdenum, 0.15-0.25).

The blades, of course, are heat treated. In electric furnaces equipped with recording pyrometers they are heated to 1650 deg. F. and then quenched in oil. Immediately upon withdrawal from the quenching bath the blade is passed to a second electric furnace in which it is drawn for 3 hrs. at 1,000-1,100 deg. F.

This heat treatment produces the following physical properties: Elastic limit, 125,000 to 130,000 lb. per sq. in.; ultimate strength, 138,000 to 145,000 lb. per sq. in.; elongation 18 to 20 per cent; reduction of

area, 57 to 62 per cent. The steel in the blade having these physical properties, with its proportional limit well over 100,000 lb. per sq. in. and the average working stress being not over 30,000 lb. it should resist fatigue stresses indefinitely.

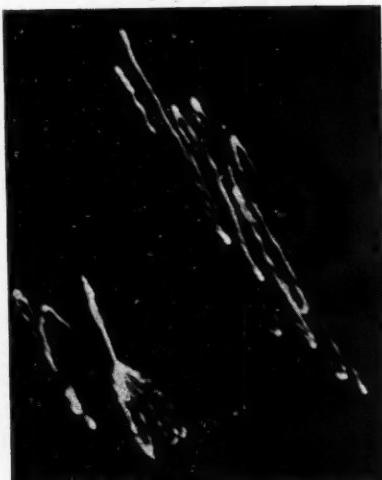
After being heat-treated the blades pass through several finishing operations, the shank being ground to fit the standard two-piece steel hub in general use or a special shank used with controllable-pitch hubs.

The Magnaflux method of testing parts of magnetic material for flaws is based on the phenomenon that finely divided iron will cling to the edges of cracks in magnetized articles. The Magnetic Laboratory of the Bureau of Standards discovered some years ago that in steel, surface cracks too small and too tightly closed to admit oil, are indicated by the tendency of finely divided iron floating in oil, to accumulate at the cracks.

In the later development of the process, carried out by A. V. de Forrest and others, dry powder is sprinkled on the surface of the piece under test, and de Forrest developed the special powder Magnaflux from which the process is named.

Magnaflux examination of a propeller blade is made by placing the blade on the testing apparatus so that it forms part of a magnetic circuit of sufficient strength so that the direction of the lines of magnetic flux passing through the blade are clearly shown when the iron powder is sprinkled on the surface of the blade. The blade surface is carefully examined while it is in the field of the magnets to detect and note any concentration or piling up of the powder, which would indicate a discontinuity in the steel. It is desirable to examine the blade with both longitudinal and transverse magnetization. Cracks and other linear defects show up most distinctly when they are at right angles to the direction of magnetization.

Fig. 1



ACCORDING to Alex Taub, development engineer of Chevrolet Motor Co., who presented a paper on Resilient Mountings at the Congress, freedom from mechanical vibration in the car can be achieved only by eliminating sources of vibration in the engine as much as possible and then supporting the engine on resilient mountings. An inherently rough engine calls for mountings of excessive softness, which are likely to be short-lived.

Mr. Taub divides engine roughness into two classes, referring to that at less than 20 m.p.h. car speed as "torque-reaction roughness" and that at over 20 m.p.h., as range roughness. Torque-reaction roughness is decreased by increasing the number of cylinders, while range roughness can be decreased by lessening the weight of reciprocating masses, providing inherent mechanical balance, and designing for greater rigidity.

If the engine is comparatively free to move about its principal axis, the vibrations induced by torque reaction will be of low frequency. A high degree of freedom in a plane transverse to the crankshaft axis assures smoothness in the upper speed range.

Mr. Taub investigated the location of the principal longitudinal axis of vibration in a number of cars. Theoretically this axis passes through the center of the universal joint at the back of the transmission and through the center of gravity of the engine-transmission unit. Actually the axis of vibration

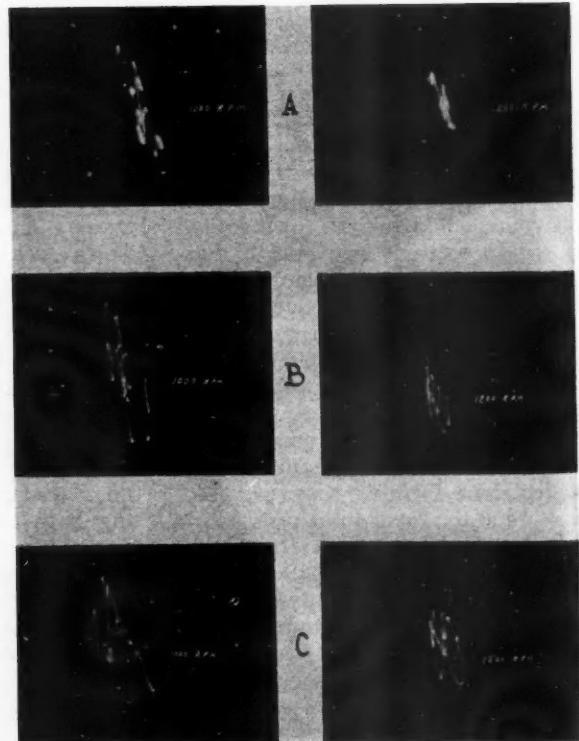
does not make as great an angle with the crankshaft as this would indicate. Since the engine is not symmetrical about the vertical plane through the crankshaft axis, the center of gravity is not vertically above that axis but slightly to one side (the valve side in an L-head engine). Both the theoretical principal axis and the actual axis of vibration therefore are inclined to both the vertical and the horizontal planes through the crankshaft axis.

In the four engines examined, while the principal longitudinal axes had an average inclination toward the horizontal of $8^{\circ} 53'$, the actual axes of vibration had an average inclination toward the horizontal of $7^{\circ} 22'$. Similarly, the principal longitudinal axis had an average inclination toward the vertical plane of $1^{\circ} 17'$, while the actual axis of vibration had an inclination of about 30° .

While highly flexible mountings make for smoothness of operation,

Fig. 2

The accompanying illustrations, as well as Fig. 1, are from photographic records made by a G.M.R. instrument for recording movements of operating units.



Around Vertical Power Axis Necessary for Smoothness

the mountings must not be made too flexible, or their life will be short. In Mr. Taub's paper, power-plant mountings of 1932 cars are divided into three groups according to torsional flexibility. Group A, in which the "rate" of the angularly flexible mountings average 1500 lb.-ft. per deg., is fairly smooth, and torque-reaction is perceptible up to 15 m.p.h. only. Group B, in which the "rate" averages 2500 lb.-ft. per deg., is described as "barely commercially smooth," and torque reaction is perceptible up to 23 m.p.h. Group C, in which the rate averages 5,000 lb.-ft. per deg., is characterized as "non-commercial," and the torque reaction is perceptible throughout the range of 5-35 m.p.h.

During the early part of 1932 an investigation was made on a series of cars with extremely flexible mountings, to compare the flexibility of their mountings with that of the average car of that period. Assuming the angular flexibility rate of 1500 lb.-ft. per deg. to be normal, the flexibility of the mounting of the four-cylinder super-flexible job was 21.45 times as great; that of the six-cylinder, 7.27 times as great, and that of the eight-cylinder, 2.33 times as great. Since all three cars are satisfactory from the smoothness standpoint, indications are that the angular flexibility should be substantially three times as great in a four as in a six, and also three times as great in a six as in an eight. It is well to remember however, that this particular eight-cylinder car had mountings nearly $2\frac{1}{2}$ times as flexible as those of the average 1932 six.

Since 1932 the torsional flexibility of engine mountings has greatly increased, the "rates" of mountings of 1933 engines being as follows:

Average six-cylinder, 1100 lb.-ft. per degree.

Max.-flexibility six-cylinder, 500 lb.-ft. per deg.

Average eight-cylinder, 1100 lb.-ft. per deg.

Max.-flexibility eight-cylinder,

725 lb.-ft. per deg.

In the six-cylinder engine jobs, torque reaction is still perceptible at 5-7 m.p.h., while in the eights it seems completely eliminated.

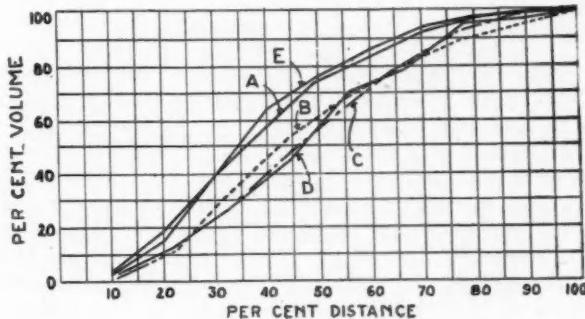
It is important to have the mountings properly located, as for a given angular flexibility the strain on them is less, and their life there-

that transverse freedom is an important factor in overcoming "range roughness."

General Motors Research Laboratory has developed a simple means of photographically recording movements of mechanical units in operation. A concave mirror is mounted so as to be free to rock

Fig. 3

Variation in combustion chamber volume against distance from spark plug.



fore greater, the nearer they are to the correct location. Deviation of the actual axis of vibration from the longitudinal principal axis is due to the effects of the mountings, and the magnitude of this deviation is a measure of the error in the location of the mountings.

"Range roughness" can be eliminated in part by the use of suitable mountings. Three years ago a study was made of crankcase deflection on the dynamometer stand, operating at fairly heavy loads. It was found that at high speeds the crankcase deformed in the horizontal plane to form an O.G. curve at the front bearing. This particular engine had a "bump" which is usually associated with high m.e.p.'s. A metal mounting was then provided at the front which, while preventing up and down movement, assured transverse freedom. This eliminated the sharp O. G. in the case, and the bump. This same bracket was installed in a 1931 car with gratifying results, and it has been shown since

around two axes at right angles to each other (horizontal and vertical). A shutter mechanism, electrically controlled, is placed between a source of light and the mirror, which latter reflects a spot of light onto a screen or a film, as may be desired. Two crankshaft revolutions are allowed for each exposure. A stroboscopic effect can also be arranged for, in which case the movement of the spot on the unit studied is slowed down on the screen. Fig. 1 herewith shows such a record, taken from a high-compression engine. It will be noted that the lines are quite wavy, while a record taken from a low-compression engine shows sharp, smooth lines.

Fig. 2 shows three light patterns A representing a low compression balanced engine; B a high compression balanced engine and C a high compression unbalanced engine. The diagrams on the left were taken at 1000 R.P.M. and those on the right at 1200.

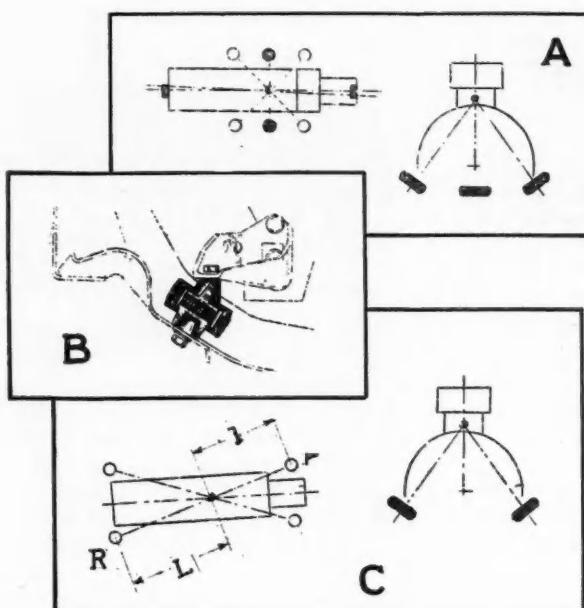


Fig. 4

In the lettered diagram $L \times R = I \times r$

Curves C, D, and E all show possible rough spots which could be eliminated with a little consideration. E represents an inherently rough engine of the L-head type, which is helped considerably by a flexible mounting.

From the foregoing discussion it is apparent that what is desired for engine mountings is:

1. Low resistance to rotation about the longitudinal principal axis.
2. Low resistance to rotation about the vertical axis through the center of gravity.
3. Minimum shift of effective principal axis and vertical axis.

The mountings may be either at the principal axis or at some distance therefrom, the latter being referred to as tangential mountings. Tangential mountings at the front may be either single-point or two-point. The single-point mounting meets the requirements of both low-speed rocking and high-speed rotation; if it is correctly placed, no compromise need be made with respect to softness. Requirements are more complex with respect to rear mountings; single-point rear mountings, although they also satisfy requirements with respect to both movements, often lack in durability.

Looking at the problem as a whole, it is seen that freedom must be provided about two axes passing through the center of gravity. What is required is universal freedom about the center of gravity, and the ideal would be a universal support at the center of gravity. This is impossible, but a fair compromise can be made by balancing the resistances to rotation around the center of gravity, making the resistance inversely proportional to the distance from the center of gravity.

Several different methods of assuring balanced resistance to motion around two axes through the center of gravity are shown in diagram in Fig. 4. At A there are single-point mountings at front and rear, acting as steady-rests, and in addition, there are universal mounts close to the center of gravity, which are placed at a tangent to the principal axis. Thus there is freedom of motion about both principal axes. B is a detail of the supports near the center of gravity. This principle may be applied in different forms, as indicated by sketch C. Different treatments are required with Hotchkiss drive and with torque-tube drive respectively, as brake and drive reactions must be provided for with the latter.

Mr. Taub argues that since rotation takes place about the inclined principal axis and is excited from the crankshaft, there is a couple around the principal axis which may be resolved into moments about horizontal and vertical axes through the center of gravity. The moment around the vertical axis, he says, is as important as that around the horizontal axis and will cause roughness unless provided for by design "or by accident."

Dynamic out-of-balance is extremely hard to eliminate at the source, and an "out-of-balance" of 4 oz.-in. will penetrate the best of mountings. For instance, a well balanced six-cylinder crankshaft may have an out-of-balance of $\frac{1}{2}$ oz.-in. at each end. If the out-of-balance is on the same side at both ends, the total will be the small amount of 1 oz.-in. On the other hand, if the two are on opposite sides of the shaft there will be a very perceptible rotating couple which can be resolved into rocking couples around horizontal and vertical axes through the middle of length of the crankshaft.

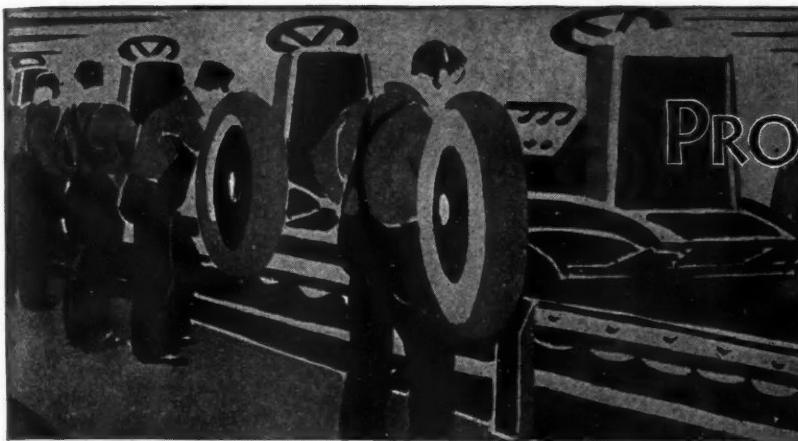
Another source of trouble is the tolerance on crankpin position as regards both radius and angular spacing. Any inaccuracy in these dimensions will have its effect on rotary movement about the vertical axis, and the need to provide transverse flexibility in the mounting to offset this is apparent. Assembly balance has been given consideration in several plants, as has also

selective balance. The latter consists in combining light and heavy sizes, instead of allowing out-of-balances to accumulate.

Combustion roughness is an old offender, says Mr. Taub, against which considerable progress has been made recently. The distribution of combustion-chamber volume is still of extreme importance, and it is felt that every engine designer should draw a curve similar to the curves shown in Fig. 3, before he "calls the job done." These curves show the variation in the volume of combustion chamber with increase in distance from the spark points. It is maintained that if the rate of increase in volume with increase in distance from the spark points is fairly uniform, combustion will be smooth, whereas if there are sudden changes in this rate, combustion will be rough.

The data for these curves are obtained in a simple manner without calculation by arranging a cutting machine that cuts spherically. A plaster cast is made of the form of the combustion chamber; spherical layers of this, concentric with the spark points, are removed successively by the cutting machine, and the volume remaining is determined after each cutting operation.

Curve A, which represents an L-head engine, is ideal, and that this form of combustion chamber gives smooth combustion has been checked repeatedly. Curve B, which represents an overhead-valve combustion chamber, is also ideal.



Trendalizing

A demonstration of the Trendalizer system of control of temperatures will be given at the National Metals Exposition by The Brown Instrument Co., at their booth. The demonstration will make it possible for visitors to see how this control system, by changing its control action in accordance with both temperature trend and the extent of deviation, duplicates the free, flexible control of a skilled operator. In fact, visitors to this Booth will have an opportunity to test their skill at control, then compare their results with the "straight-line" control effected automatically by the Brown Trendalizer.

Looking Ahead

R. E. W. Harrison of Ingersoll Milling Machine Co., intimates in his discussion of C. E. Bleicher's S. A. E. paper on external broaching, that milling machine manufacturers have something up their sleeves. If the factory is willing to accept a revolutionary change in milling practice, there seems to be much promise of low-cost operation in the offing. Well, Mr. Harrison, any time you feel free to tell us more about your plans we shall be tickled pink to pass the information on to our readers. We know they'll be interested.

'Tis an Ill Wind

You remember the proverb. Well, the transmission builder who's worrying about silent gears is looking to the steel maker for a solution of his problem. And the like-

lihood is that the mill which can take the initiative is going to get a fine slice of business. What is wanted is better control of specifications, better grain structure, and better heat treating properties. Opportunity here for a constructive job for all concerned. At least that's the impression we got from the S. A. E. production session at Chicago.

Frequently Overlooked

When comparing alloy and carbon steels give a thought to the time required to complete transformations of structure in the hardening operation. Whereas carbon steels require drastic quenching for maximum grain refinement, the rate of transformation of alloy steels can be sufficiently retarded by additions of nickel. For example, in a 3% nickel, 1.50% chromium cast steel, the hardening time limit is about 500 seconds, as compared with the six seconds for a cast carbon steel. Hence the nickel-chromium steel can be hardened throughout in sections which, with the unalloyed steel, would be hard only on the outer rim.

Starting Diesels

In getting about we find that at least one prominent Diesel engine builder is making remarkable progress in the truck replacement field. His engines are replacing the standard truck engines in their own chassis. Now the big problem is the matter of starting equipment since the battery in the vehicle is usually old or in bad shape and in any event quite inadequate for the

demand of the new power plant. So it is the policy of this Diesel engine builder to recommend the installation of a new battery of adequate size and capacity when his engine goes in. It is found that a 17 plate battery has sufficient instantaneous discharge to kick over the Diesel under usual operating conditions. For zero starting, a 21 plate battery is recommended.

Tells the Story

Udylite is proud of its new stripping test that tells how thick the plate. This is easily the most important test for quality in a rust-resistant coating. The new test is more accurate and more reliable than the old. It is fast; independent of impurities; and independent of the kind of base metal. For complete details see *The Udylite News* for August, 1933.

Must Balance

Prof. C. A. Norman of Ohio State makes a stirring plea in *Mechanical Engineering* September, 1933, to engineers and industrialists for an honest and clear appraisal of the economic depression and its implications. In his article, "Production and Purchasing Power," he presents a formidable array of evidence in support of his thesis that the all-embracing problem still is one of balancing production and consumption. Also the pressing need of spreading profits among the masses who produce and consume. We recommend a careful reading of this article as its form and implications are much too comprehensive to summarize in any brief review.—J. G.

MANUFACTURING
MANAGEMENT
METALLURGY

September 16, 1933

Airplane Engine Expected to Double

NO radical departure from the present type of four-cycle, spark-ignition gasoline engine for aircraft service is likely in the next 10 or 15 years in the opinion of A. H. R. Fedden, Bristol Aeroplane Co., Ltd., England, who presented a paper on Possible Future Development of Air-Cooled Aero Engines. What Mr. Fedden does expect to see is detail changes and developments, reduction in the volume of the engine, and an improvement in fuel consumption. He thinks that if the present type of gasoline engine is superseded by a radically different power unit, the latter probably will be accepted first in the automobile field.

A comprehensive digest of this interesting and important paper follows. It was digested briefly in our issue of Aug. 26.

Mr. Fedden feels sure that the aircraft engine of the future must follow the trend of the automobile engine in respect to specific output, and more power must be obtained from a given displacement for both take-off and cruising. In 1920, 15 rated hp. per liter was considered a reasonable output for aircraft gasoline engines; today the figure is 20-25 rated hp. per liter, and Mr. Fedden said he expected to see

40-50 hp. per liter obtained within the period under review.

No startling reduction in weight is anticipated; in fact, certain components may have to be made heavier to afford additional stiffness and bearing capacity; advantages which may be expected in new designs of engines include a reduction in scale, increased overall efficiency, and reduced fuel consumption. Fuel and oil consumption are very important, for one thing because of their effect on the gross weight, and the engine of the future will not be judged purely on its specific dry weight, but on its total weight with full equipment, including exhaust manifolds, air shutter, oil cooler, cowling, etc., and with fuel and oil for a definite cruising range.

Increasing the compression ratio is one of the most useful means of obtaining higher engine performance. Briefly its effect is to increase the b.m.e.p., the thermal efficiency, and the maximum ex-

plosion pressure, and to decrease the residual-exhaust temperature and the fuel consumption. The improvement obtained is limited by detonation and maximum permissible explosion pressures.

While the problem of detonation has been attacked with a fair degree of success by fuel technologists, British aircraft-engine designers are faced with special difficulties because British aircraft, both civil and military, must operate in many different countries and use a wide range of fuels. It requires little imagination to realize the serious damage that may be done to an engine if allowed to run continuously on a detonating fuel at any considerable throttle opening. Until last year no country except the United States had standardized a fuel of high octane value. The U. S. has standardized a "fighting grade" fuel of 87 octane rating for some time past; a movement is now under way in Europe to standardize a fuel of still higher anti-

Probable Trends Seen by Mr. Fedden

Specific output increases from the present average of .33-.41 to .66-.82 hp. per cu. in.

* * *

No startling reduction in power plant weight, but an increase in payload capacity for a given range or an increase in range with a given payload, resulting from improved fuel and oil economy.

* * *

Standardization of a fuel of high octane rating to permit use of higher compressions.

* * *

Superchargers standard on practically all aircraft engines.

* * *

Ultimate solution of problem of cooling high

output engines may involve putting engine in permanent duct with an engine-driven fan to provide forced draft.

* * *

Higher engine speeds, geared propeller drives and, for cylinders of more than 183 cu. in., four valves.

* * *

Hydraulic tappets with overhead camshaft acting directly on valves an ultimate possibility.

* * *

Harder crankshafts to run in harder bearings.

* * *

Diesel engines of about 1830 cu. in. displacement in certain civil fields.

Design Progress Specific Outputs

knock value, and Italy is using a 100-octane fuel for some squadrons.

The British Air Ministry until recently specified a blended fuel with a certain percentage of aromatics and having an octane value of 73 (69 by the U. S. Army specification Y 3557E method). Fuel of 77 octane number by the modified CFR method is being standardized this autumn, and there is a movement on foot to go to a still higher number next year. The improvement in the anti-knock value can be obtained by the addition of a considerable proportion of aromatics. The chief objection to this blend is that it shows a high octane value only at low temperatures, which is a serious failing for all high-efficiency engines, and particularly air-cooled engines. For such the most satisfactory fuel is a straight-run fuel with high naphthene content and good lead susceptibility, with the addition of a small percentage of tetra-ethyl lead. This fuel is preferable to benzol mixtures also because of the high freezing point of benzol and the fact that in the event of hostilities benzol would be needed for the manufacture of explosives.

Mr. Fedden expressed the view that at the present time there is no question of greater importance to engine development than the standardization of a fuel of high octane rating, and he also stressed the need for an international agreement regarding a method of determining octane values. The best solution of the problem of a high-octane-value aircraft fuel in his estimation is the addition of a small proportion of tetra-ethyl lead, not to exceed 4 c.c. per gallon. The reason for this limit is that available fuels show a low "lead consciousness" with higher concentrations, and tetra-ethyl lead introduces a number of problems not encountered with normal fuels, such as corrosion of valves, valve seats, cylinders, etc. More importance is attached to fuel economy in England than in certain other countries, and

Fedden sketches probable trends in aircraft power plants to meet operating requirements

aircraft engines are subjected to a special 50-hour cruising consumption test to establish maximum allowable consumptions for any particular type.

Increased gas pressures resulting from an increase in the compression ratio may require strengthening of the piston pins and articulation pins, but Mr. Fedden believes that no strengthening of the pistons will be required, because any piston of sufficient section to afford adequate cooling will be strong enough to stand the increased load due to any reasonable increase in compression ratio. He believes that the present design of forged piston is stabilized for some considerable time. The problem of satisfactory exhaust valves and seats is rendered easier by an increase in compression ratio, since the exhaust temperature is lowered.

Some designers have considered it permissible to provide supercharged engines with rather inadequate breathing organs, but experiments at the Bristol company have conclusively proved that to obtain satisfactory and efficient supercharging the engine must start off with the freest and most efficient breathing function possible.

With a supercharged engine, for a given increment in horsepower, the advance in explosion pressure is not so great as that obtained by increasing the compression ratio, but the cylinder and exhaust gas temperatures are considerably higher, so that cooling difficulties are greatly intensified, and

fuel consumption is adversely affected, while the extent to which intake pressures may be increased is again limited by detonation, unless an inter-cooler is employed.

By far the greatest number of aircraft engines today employ the mechanically driven centrifugal fan type of supercharger, for the reason that it has been found to be the easiest to install, the lightest and the most compact form, taking into consideration the comparatively limited speed range of an aircraft engine. There is little to choose between the efficiencies of the available types. The centrifugal fan type has an overall adiabatic efficiency of 65 to 70 per cent, and the Roots blower a peak efficiency of 75 per cent.

As regards future development of superchargers, Mr. Fedden believes that some form of compressor will be standardized for all aircraft engines to obtain higher output from a given displacement. For smaller engines, where first cost is of great importance, the two-stroke type with direct fuel injection offers further scope for supercharging.

If it becomes necessary to restore the ground-level power at greater altitudes than 15,000 ft., still maintaining reasonable take-off power, the two-speed centrifugal blower offers the most practical solution. With the introduction of the two-speed blower it will be necessary to use mixture inter-coolers, which latter must not be excessively heavy or bulky, nor of high drag, and

their design is a problem which will demand considerable ingenuity.

If the demand for restoration of power to still higher altitude becomes insistent there may be a reversion to the exhaust turbo compressor which, in a somewhat modified form, offers many advantages. An interesting engine appeared at the Paris Salon of last December, incorporating some of these modifications. This 12-cylinder horizontally opposed Potez engine is the first attempt to interpret the late M. Rateau's final views of the exhaust turbo system, to avoid the disadvantages of the earlier type. The cycle of operations is as follows:

1. After explosion, the first exhaust valve, which is connected to the turbo charger, opens, and the initial blast of hot exhaust gas drives the compressor.

2. At the end of the firing stroke the second exhaust valve begins to open, in order to permit an uninterrupted exhaust; thus the engine is not required to function under any back pressure.

3. Both exhaust valves close at the end of the exhaust stroke, and one inlet valve opens, admitting pure air from one end of the blower.

4. Toward the end of the induction stroke the second inlet valve opens, to admit very rich mixture, which is supplied from the second half of the blower, in conjunction with a single choke Zenith carburetor for each bank.

The use of air-cooled engines is likely to increase, but liquid cooling may become the standard for highly specialized military aircraft. However, the liquid-cooled engine probably will have to employ steam cooling or Prestone cooling in order to maintain its position, because the weight of cooling water and radiator as employed with the present system will be considered prohibitive.

The recent adoption of ring cowlings for radial aircraft engines has provided striking confirmation of the view that the requirements of cooling and low drag are incompatible, and the designer of air-cooled engines will have to use all his ingenuity to improve efficiency and to provide increased fin area. The cooling surface of any engine must dissipate a quantity of heat equivalent to approximately 60 per cent of the brake horse-power. In the case of air-cooled engines, the fin area required to effect this rate of heat dissipation is dependent upon design and installation condi-

tions, and, until controllable ring cowling is standard in some practicable form, engines will have to be designed to meet the worst possible installation.

Until recently 6 sq. in. of cooling surface per cu. in. displacement was considered normal practice, while at present 11 to 12 sq. in. are employed on the most up-to-date geared and supercharged engines. During the period under review, the introduction of higher output and considerably higher rotational speed may entail an approach to 15-20 sq. in. per cu. in. displacement. It is, of course, easily possible to add excessive fin area without increasing the cooling capacity. According to D. R. Pye, deputy director of scientific research in the Air Ministry, the minimum allowable clear space between fins, if interference between boundary layers and the consequent drop in heat dissipation are to be avoided, appears to be 0.15 in. when the air has to flow between the fins for a distance of 6 in. from the leading edge in the downstream direction. It is quite conceivable that the ultimate solution of the cooling problem will lie in the permanent enclosure of the engine in a duct and cooling it by an engine-driven fan.

As a result of a series of tests, the Bristol Company evolved its present type of cylinder, with a cooling area 66 per cent greater than that of the Jupiter type of cylinder and with four times the life under low wind-speed, full-throttle test conditions. Such results were made possible only by the forged head design of cylinder, on which, with modern machining methods, the increased cooling area is obtained by close-pitched deep but efficient finning, which it would be impossible to produce by any form of sand or die casting. In this connection the Bristol company has always held that the maximum benefit can only be derived from close-pitch finning, when these fins are machined from a solid forging, as the air spaces between the fins of a cast close-pitch fin surface are necessarily curtailed by the minimum thickness of fin which it is possible to cast for any given depth.

One of the most logical methods of obtaining more power from a given volume is by increasing the crankshaft speed, and Mr. Fedden is quite sure that the aircraft engine designer must face this step during the period under review, although it brings in its train a whole series of knotty problems,

such as the breathing capacity in the cylinders, improved technique of valve mechanism, strength and rigidity of the crankshaft and connecting rods (the loads on many of the moving parts being increased as the square of the speed), and the necessity of providing reduction gearing to maintain propeller efficiency. These are all aside from the problem of cylinder cooling, already discussed.

With a cylinder of 183 cu. in. displacement it will be absolutely necessary to use four valves when operating at over 2200 r.p.m., if the necessary efficiency is to be obtained. For speeds of 3500-4000 r.p.m., if two valves are to be retained the displacement of the cylinder must not exceed 91 cu. in.

By extended development reliable continuous running can be obtained from a four-valve cylinder of 183 cu. in. displacement with mechanical compensation to the pushrod mechanism up to 3000 r.p.m. Adequate life of the mechanism may be preserved a stage further with the aid of hydraulic tappets, the possibilities of which are now being explored by a number of manufacturers, but for speeds of about 4000 r.p.m. it is probable that overhead camshaft construction with as nearly as possible direct valve actuation will become necessary. At elevated temperatures the valve-seating velocity should not exceed 1.5 ft. per sec., except with sodium-cooled valves.

Increased engine speeds mean higher bearing loads, and in spite of skillful design aiming at greater strength and rigidity of the crankshaft, it has been necessary to depart from even the hardest family of white metals which have been standard in British aero engine practice in the past. Development of harder bearing metals, as employed in the steel-backed, lead-bronze bearings developed in America, will permit of higher crankshaft speeds, and although it has been reported that certain American firms using such bearings have obtained satisfactory service with unhardened journals, in view of the service conditions to which British engines are submitted, Mr. Fedden said he should not like to change over to a lead-bronze bearing on an unhardened shaft. In his opinion, one of the main governing factors of big-end-bearing capacity is the difference in hardness between the materials of the bearing and the shaft, so that when it has been found necessary to increase the hardness of

the bearing material to cope with increased loading, it is also necessary to increase the hardness of the shaft.

For the crankshaft the engine designer has the alternatives of case-hardening alloy steel, nitrided steel of the nitrally type, and nitriding chrome molybdenum steel. The Brinell hardness obtainable with the first and third types is between 650 and 750, while with nitrally hardnesses of 800-1100 are obtained. Mr. Fedden believes that chrome-molybdenum steel, nitrided, offers the best solution, owing to the freedom from difficulties experienced when case-hardening large-diameter shafts.

For bearings, the most promising alternatives are the lead bronze plain bearing and the needle roller type. For the period under review the former is favored, because the latter, although attractive, presents many difficult problems.

Increased engine speed necessitates the use of reduction gears; the use of such gears on high-powered engines has been very general in England during the past several years and the Bristol company has not produced any direct-drive radial air-cooled engines for three years. With engines of the type here discussed, in which high output is obtained by combining high m.e.p.s. with high rotative speeds, reduction gears will be a necessity.

M. Waseige, technical director of the Farman firm, has laid down the rule that an efficient two-bladed propeller should pass 3.25 lb. of air per hp. per sec. and top speeds should not exceed 820 ft. per sec. for low-altitude and 980 ft. per sec. for high-altitude machines.

For air-cooled radial engines reduction gears of the concentric type are necessary, to obviate air-flow interference, and the Farman bevel reduction gears offers several advantages. It is very robust, gives considerable damping effect, and enables a good range of propeller speed reduction to be obtained.

While the British Air Ministry introduced a straight mineral lubricant three years ago, several European countries still adhere to vegetable-base oils for air-cooled engines, chiefly for national reasons, but Mr. Fedden believes this practice is bound to fall into disuse gradually, owing to ring-gumming troubles and the instability of such oils over prolonged periods.

Two problems of importance are oil consumption and sludging. It has been shown that in air-cooled

engines the consumption is extremely critical, there being a rapid rise after a certain engine speed is reached. Reduction in oil consumption on radial air-cooled engines may be achieved by the use of stiffer cylinder flanges, barrels and skirts; bottle-necking of the cylinder, additional compression and oil rings, and more efficient crankcase breathing and oil scavenging.

As to the use of Diesel engines for aircraft, Mr. Fedden said his company had been working on their development for a number of years, and some promising results had been obtained. A fuel consumption of 0.36 lb. per b. hp-hr. can be obtained consistently at cruising powers with steady running and clean exhaust, and 0.39 lb. per b. hp-hr. at normal power, but this is not possible at as high a b.m.e.p. and anything like as high a power-weight ratio as with gasoline engines. Owing to the high maximum pressures involved, and particularly the high rate of pressure rise, engine components must be considerably heavier than in gasoline engines of equal power. Mr. Fedden believes it is safe to say that a successful compression-ignition engine will weigh 30-40 per cent more than its gasoline counterpart, but will have a cruising consumption 30 per cent less. Flight tests have shown that with Diesel engines the

power falls off much less rapidly with altitude than is the case with gasoline engines, and for this reason it is felt that a compression-ignition engine will show an advantage in all-up weight on a flight of four-hours duration, when cruising at approximately 10,000 ft. altitude.

One of the greatest obstacles to the use of compression-ignition engines has been inability to obtain a high b.m.e.p. for take-off, but it has been found that this difficulty can be overcome to an extent by supercharging. The advantages of the Diesel for aircraft are being reduced, however, by the increase in octane value of aviation gasoline, and by the development of hydrogenated safety fuel, which reduces fire risks. Mr. Fedden cannot visualize, during the period under review, the use of compression-ignition engines for light sports aircraft, single-seater fighters, and general-purpose military aircraft, but he believes it may mature in Europe in moderate sizes of about 30 litres (1830 cu. in.) displacement, for certain civil purposes, such as mail carrying, where fuel consumption and the quality of fuel are governing factors, and that we shall probably see the development of a large two-cycle compression-ignition engine for large flying boats within the period under consideration.

Low Vapor Pressure and High Volatility Give Best Economy

"ECONOMY Through Fuel Selection" was the subject of a paper by Dr. Oscar C. Bridgeman of the Bureau of Standards. The author said this subject might be approached from two different points of view, that of conservation of our natural resources, and that of the operator, and that he would discuss it from the last-mentioned standpoint.

After discussing the effects of various fuel characteristics on evaporation losses, boiling in fuel lines, engine starting, engine acceleration, and mixture distribution, the author draws the following conclusions:

"From the standpoint of minimum fuel consumption for a given desired performance, it appears that the fuel should have a low vapor pressure and a high volatility. Under many conditions, a com-

promise is necessary between vapor pressure and 10 per cent point temperature. Also a compromise is necessary between volatility and gravity of the fuel. For a fleet operator who is willing to make suitable carburetor adjustments, careful fuel selection can result in considerable saving in fuel consumption."

Brake Testing Machine Correction

Referring to the description of a new brake-testing machine in *Automotive Industries* of Aug. 5, the Oil-gear Company write us that they designed and built only the hydraulic drive, and that the remainder of the machine was a product of American Brake Materials Corporation.

Treiber Gives Details on Design of Hercules Diesel

In addition to discussing the Diesel cycle in a general way, O. D. Treiber of the Hercules Motor Co. in his S. A. E. Congress paper gave considerable information concerning construction details and performance of the new Hercules Diesel engine which was described in July 29 *Automotive Industries*. The

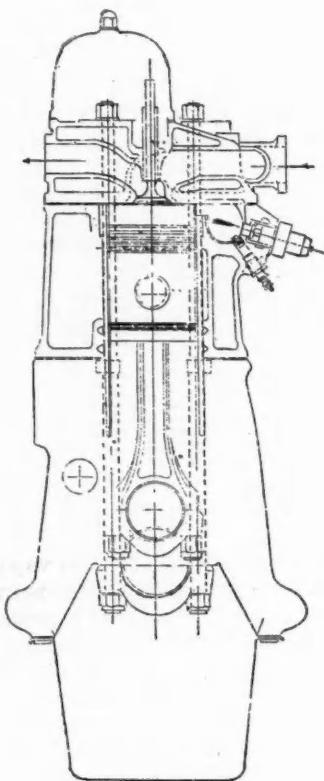


Fig. 1 — Cross-sectional sketch of Hercules Diesel engine

feature of this engine is a combustion chamber arranged at the side of the cylinder, in such a manner that transfer of the charge from the cylinder to the combustion chamber results in considerable turbulence in the combustion chamber.

Fig. 1 shows a cross section of

the cylinder and spherical combustion chamber. The passage between the cylinder and combustion chamber is closed by the piston toward the end of the up-stroke, and at the completion of this stroke there is very little clearance between the piston and the cylinder head. The velocity of the air entering the spherical combustion chamber tangentially results in a revolving motion in the chamber, and the velocity of rotation is proportional to the velocity of the air through the passageway, which is greater the less the vertical depth of the passageway.

At 2,000 r.p.m. the air velocity in the passageway is substantially constant from 90 deg. to 60 deg. ahead of top dead center, as shown in Fig. 2. From 60 deg. ahead of top dead center the air velocity in the passageway would decrease to zero at top center, if the passageway were made to have a constant area. The natural result would be that the angular velocity of the air in the spherical combustion chamber would be slowed down and that the combustion process would lose in efficiency.

In the Hercules engine this slowing down of the air stream through the passageway shortly before the

end of the compression stroke is prevented by so arranging matters that the piston gradually closes the passageway as it approaches the end of the stroke. As shown in Fig. 2, the velocity of the air through the passageway continues to increase up to 12 deg. ahead of top center, at which point the angular velocity of the air in the combustion chamber is fifty times that of the crank-shaft. This high turbulence comes just in time to influence the air-fuel mixing process and is sufficiently rapid to give a high rate of combustion, yet not sufficiently high to produce objectionable knock. Fig. 3 is a time-pressure diagram of the Hercules Diesel six-cylinder 5 by 6-in. engine, taken at 1300 r.p.m. when the engine was developing a b.m.e.p. of 112 lb. per sq. in. (corrected). A point-to-point indicator of the balanced-diaphragm type was used, and readings were taken 30 deg. apart, except over the range 30 deg. ahead to 30 deg. past top center, where they were taken 2 deg. apart.

Combustion starts at 10 deg. ahead of top center, and at 5 deg. ahead of top center the pressure rise is at the rate of 50 lb. per sq. in. per deg. of crank travel. At this rate of rise the pressure line

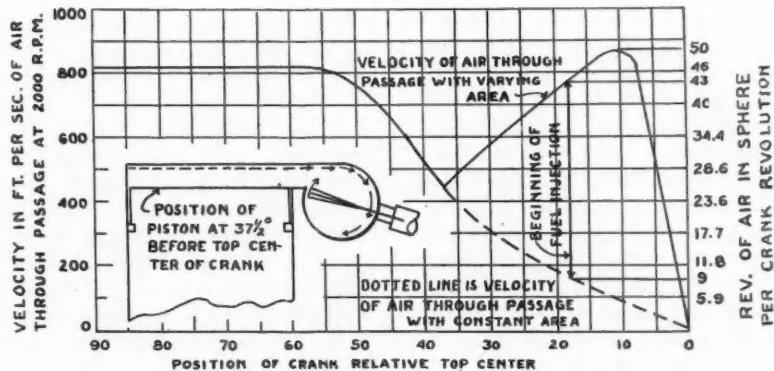
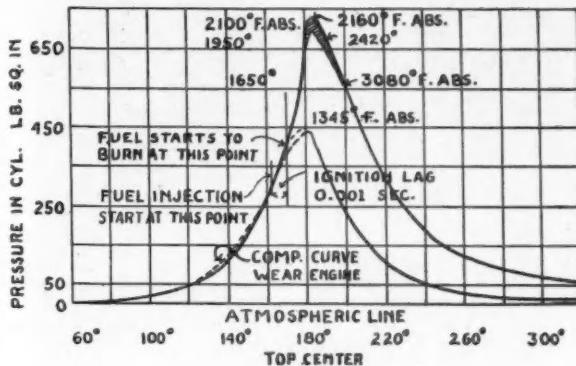


Fig. 2—Variation of turbulence with crank position

crosses the top center line, at a pressure of 710 lb. per sq. in. It continues to increase until the maximum of 760 lb. per sq. in. is reached, at 4 deg. past top center. Injection is completed at 14 deg. past top center, and combustion at 20 deg. past top center, or after the completion of $2\frac{1}{4}$ per cent of the piston stroke. This gives a very high expansion ratio and still leaves the maximum pressure reasonably low, thus reducing the stresses on the engine. The fuel consumption is 0.41 lb. per hp-hr., which represents a thermal efficiency of 33.7 per cent.

Fig. 3 — Indicator diagrams taken from Hercules Diesel engine at 1300 r.p.m.



Quest for Higher Outputs May Bring Two-Stage Power Plants

DEVELOPMENT of cylinders of the poppet-valve type for high specific output was undertaken at Wright Field in September of 1930. The original intention was to determine the limitations of the poppet exhaust valve under high brake mean effective pressures, under ideal conditions such as can be obtained in a single-cylinder test engine.

This development work was discussed by Ford L. Prescott, senior mechanical Engineer (Research) Materiel Division, Army Air Corps, in his S. A. E. Congress paper on High-Output Poppet-Valve Cylinders. Mr. Prescott described experiments with both air-cooled and water-cooled supercharged cylinders. The Materiel Division pressure indicator, developed by Mr. Prescott, was used in the tests.

We reproduce herewith a pressure-volume diagram taken from a single-cylinder water-cooled engine of 4-5/8 by 7 in. cylinder dimensions (117.6 cu. in.), with steel barrel and water jacket and cast aluminum head. The connection between the cylinder and head jackets was external. The head was hemispherical in form and contained two valves, the latter being of the hollow-stem, hollow-head, sodium-cooled type, and seated on valve inserts of austenitic steel. The jacket water was maintained at 150-180 deg. and the engine was operated at 1900 r.p.m. The card

shown below was one of the best taken while the engine was operating at a b.m.e.p. of over 500 lb. per sq. in. While it was being taken the engine operated very steadily.

While the indicator diagram reproduced shows a b.m.e.p. of 539 lb. per sq. in., in another run at 1800 r.p.m. a b.m.e.p. of 579 lb. per sq. in. was obtained, and this is believed to be the highest output ever obtained from an engine cylinder to date. Operation of the engine at this extreme output was erratic, however.

As to possible future applications of high-output cylinders, Mr. Prescott had the following to say: "Future developments will utilize small, high-performance cylinders, possibly as fire-boxes, while the large amount of energy released in the exhaust at 350 lb. per sq. in. is utilized in cylinders in which no

combustion occurs. In this manner it should be possible to make an Otto cycle engine which will operate at Diesel fuel consumptions. It appears from tests so far conducted that cylinders, pistons, valves, spark plugs, wrist pins, crank pins and connecting rods should be investigated for possible higher permissible loadings, since the parts used in these tests were, many of them, normal engine parts. The use of rather heavy pistons at high specific output would serve to reduce the gas loads on connecting rod, bearings and crankshaft by reason of their greater inertia, in addition to giving lower and more uniform operating temperatures. Valves do not appear to be the limiting factor in pushing the output to higher values, and spark plugs are available which give good account of themselves for such work."

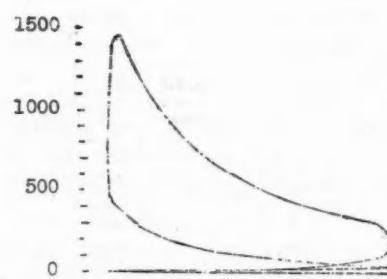
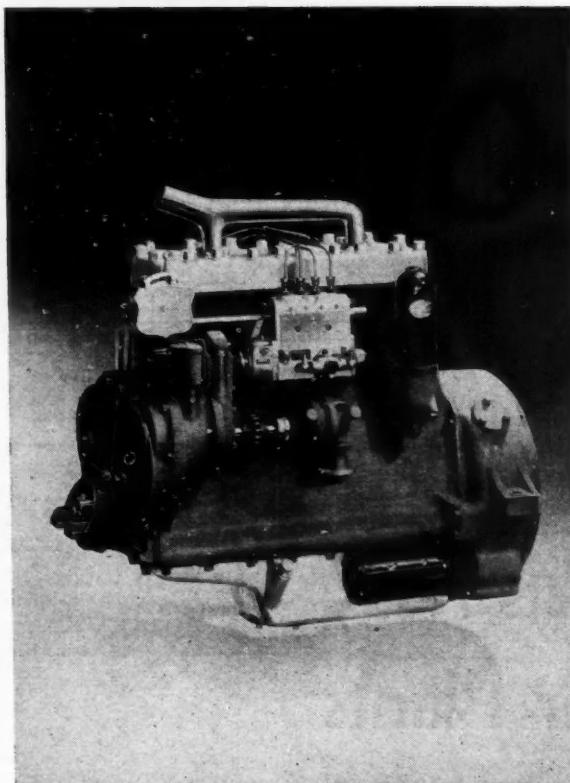


Diagram from high-performance cylinder

Speed, 1900 r.p.m.; b.m.e.p., 539 lb. per sq. in.; spark advance, 29 deg.; fuel consumption, 0.478 lb. per hp-hr.; water consumption, 0.237 lb. per hp-hr.; supercharge, 72 in. of mercury column; barometer, 29.34 in.; output, 152 b.h.p.



Monovalve four-cylinder Diesel engine of 125 hp. at 2,000 r.p.m.

A DIESEL engine with cylinders of L-head type and using a single valve for both the inlet and exhaust has been developed for automotive, marine, agricultural and general industrial power requirements by the American Diesel Engine Company of Oakland, Calif. The use of a single valve per cylinder makes the L-head construction practicable, which has the advantages of greater compactness and greater simplicity of the valve-operating gear. The engine is started and operated in the same way as a gasoline engine, except that the choking (or priming) and warming-up operations are eliminated. It is claimed, moreover, that the "Monovalve" has an advantage over the gasoline engine with respect to both flexibility and lugging capacity.

The engine described, known as the Model 4-75, is rated at 125 hp. at 2000 r.p.m., which corresponds to a b.m.e.p. of 75 lb. per sq. in. The displacement of the engine, therefore, is 660 cu. in.

The engine has a standard Bosch fuel pump, Type P. E., and Bosch pintle-type nozzles, adequately water-cooled, with a self-cleaning ori-

fice of about 0.080 in. diameter. Fuel is injected under a pressure of 1200 lb. per sq. in. This low pressure is said to assure long life of the fuel-injection equipment and also to make it possible to meter the fuel accurately at all operating speeds. Another advantage of the low-injection pressure, in conjunction with the high degree of turbulence in the cylinder, is said to be that the engine is not sensitive to changes in fuel characteristics, including viscosity.

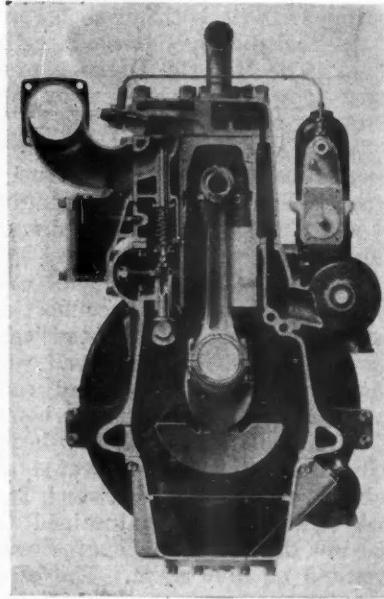
By using a single valve per cylinder, the shape of the combustion chamber can be so altered as to readily adapt it to direct fuel injection. A high degree of turbulence is assured by the fact that practically all of the air within the cylinder is forced from the cylinder proper into the combustion chamber over the single valve during the compression stroke. Fuel injection takes place about the time the last part of the air charge is leaving the cylinder. Expansion and combustion force the piston down and allow practically all of the compressed

New L-Head One Valve

Low injection pressures and lack of sensitiveness to changes in fuel characteristics among advantages advanced for design

and burning gas to pass from the combustion space back into the cylinder, with a swirling motion.

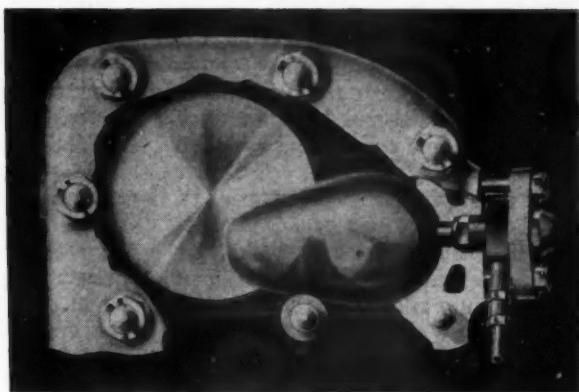
For the monovalve construction the advantages claimed are that it reduces the number of parts and tends to keep the valve cooler than the exhaust valve in the usual design, since the single valve is swept alternately by the hot exhaust gases



Cross section through cylinder

Showing relation of valve chamber to cylinder bore and location of injection valve

Diesel Has Only One Cylinder



and the incoming fresh and cool air.

It might be thought that if the exhaust gases are discharged and air is drawn in through the same valve, there would be a tendency for spent gases to be sucked back into the cylinder. It is said, however, that the scavenging of the engine is excellent and the action is explained as follows:

"During the exhaust stroke the spent gases are discharged at high velocity through the open valve port into the venturiform exhaust pipe. This causes a vacuum to be formed on the intake side of the manifold, which is broken by a rush of air under atmospheric pressure through the air-filter element and up into the exhaust pipe.

"As the piston starts on the intake stroke, a vacuum is created at the valve port, owing to the fact that the valve remains open. The kinetic energy imparted to the exhaust gases during the exhaust stroke tends to keep them in motion in the exhaust manifold, and as the piston descends, fresh air is drawn through the air filter on the inlet side of the manifold. It is naturally much easier to merely deflect a stream of fresh air already flowing toward the valve port at the time the inlet stroke begins, than it is to completely reverse the direction of travel of the exhaust gases, which are flowing at high velocity away from the valve port."

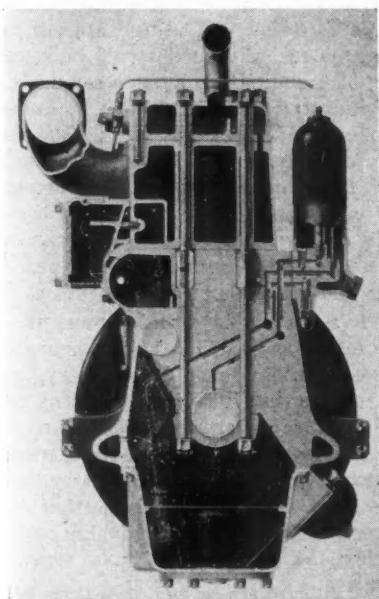
The lubrication system of the engine combines a primary and a secondary circulation system. The oil, after being screened, is delivered by a pump through passages drilled in the crankcase to a Hall-Winslow micromesh filter. It returns through a second passage drilled in the crankcase. Both passages are surrounded by cooling water, for oil-temperature control, and is then distributed to the various bearings. In the base of the filter there is a pressure-relief valve, the discharge from which is directed by suitable orifices against the sides of the con-

nnecting rods, and thus splashed up into the cylinders from the bottom.

The secondary system is of value particularly while starting the engine from cold. The oil in the crankcase is likely to be quite viscous then, with the result that although the pressure generated by the pump rises sharply immediately, little oil is passed through the bearings. The pressure relief valve then opens almost immediately and practically all of the oil moved by the pump is discharged through it and splashed about within the engine by the connecting rods. This tends to prevent loss of compression while starting, and it also reduces cylinder wear.

As the engine reaches its normal temperature the oil-temperature control feature previously referred to becomes effective. Crankcase ventilation is assured by drawing air through a self-cleaning breather filter, which is also used for the lubricating-oil filler tube. In operation, air is drawn in through the breather filter and passes down through the timing-gear case at the forward end of the engine, whence it flows toward the flywheel end and up into the valve-spring chamber. The ventilating air passing through the crankcase picks up some of the lighter fractions of the lubricating oil, and some of this lubricating oil is deposited in the valve chamber when the air holding it in suspension comes in contact with the water-cooled walls of the upper part of this chamber. Some of this oil collects in a cup at the lower end of the valve-stem guide and lubricates the guide. All oil passages in the Monovalve engine are drilled in the block, and there are no extraneous oil lines.

An air filter and inlet silencer is built directly into the engine, forming part of the inlet manifold. It is self-cleaning, the dust collected and oily sludge being discharged from the bottom of the filter and



Cross section between cylinders showing "through bolts" tying cylinder head and valve caps together, and oil passages to and from oil filter

out through the exhaust manifold. All forces originating from the gas pressures and inertia of moving parts are taken up on members of chrome-nickel-molybdenum steel. Crankshaft and connecting rods are made of this material. Cylinder block and cylinder head are cast of nickel chromium iron, which is heat-treated. Both pistons and crankcases are made in either cast iron or aluminum alloy, according to the service for which the engine is intended.

The engine is designed to conform with S. A. E. standards. All accessories are gear-driven and mounted in accordance with S. A. E. practice.

When the engine is used for vehicle propulsion a novel fuel-governing system is provided. The speed of the engine is controlled by a governor and can be varied by the driver by means of the accelerator pedal. By pulling up on the pedal the engine is stopped. While the vehicle is coasting no fuel is in-

jected, a feature which adds further to the fuel economy.

A novel compression release is provided and has manual control. This enables the driver to use the engine as a brake while descending long grades and to vary the braking effect at will.

The weight of the complete engine is given as 1900 lb., which makes the specific weight equal to a little over 15 lb. per hp. This weight probably applies to the engine with aluminum crankcase.

Coordination Badly Needed to Avoid Hazards of Conflicting Codes

WASHINGTON, D. C.—The question of where one industry or trade ends and another one begins, is presenting some mighty vexing problems in connection with the approval and subsequent administration of codes of fair competition. Already a number of questions of jurisdiction and of conflict have arisen in connection with the automotive industry alone.

At the hearing on the N.A.C.C. code, for example, President Macaulay referred to possible conflicts with the A.P.E.M. code which might work injustice on one group or the other. He said in part: "Since a close interrelationship exists between this industry and the parts and accessory groups, any differences in the minimum wage rates or in maximum hours of work would necessarily operate to the disadvantage of one group of employers and employees as against the other. It is therefore necessary that this industry work in close cooperation with the parts and accessory manufacturers in developing standards that will be fair to all...."

Moreover, as *Automotive Industries* pointed out recently, the oil code raises a number of questions of vital importance to garage equipment manufacturers, jobbers and dealers. Perhaps the most serious of these is whether automotive jobbers must choose between selling petroleum lubricants, an important source of income for many of them, and items of shop equipment proscribed for petroleum wholesalers. This question also is of considerable importance to many lubricant manufacturers who depend to

a substantial degree on automotive jobbers. Whether automotive jobbers now selling lubricants and the proscribed items of shop equipment must choose between them, NRA has not ruled definitely but *Automotive Industries* has been told informally that the code appears to make this choice necessary.

Who's who in the automotive maintenance field also will have to be determined as conflicting codes have been prepared by different groups. The National Automobile Dealer Association Code covers automobile retailing and/or servicing and/or repairing industry. On the other hand, the National Automotive Maintenance Association, organized by independent repairmen, covers garages and repair shop's repairing, servicing, rebuilding, overhauling, improving and other work is performed on automotive vehicles. This definition obviously includes the car dealer service station, while the N.A.D.A. definition includes the independent repair shop. The N.A.M.A. code also covers storage and parking, despite the fact that storage and parking interests already have filed a code with NRA.

The code of the automotive wholesale industry moreover would bring wholesale functions which car makers perform under its jurisdiction, and when the N.A.C.C. gets around to filing fair trade rules, it is quite possible that some of the rules will conflict with the wholesaler's code. Another conflict may be occasioned by any code written to cover tire merchandising.

This brief resume of some of the

conflicts that have arisen already indicate the complexity of the problem and show rather conclusively that at some stage of the game, somebody is going to have to do some tall coordinating. Whether NRA will undertake this job before the various codes come up for hearings or whether the various trade and industrial groups will have to look out for their own interests, is open to conjecture. On the basis of NRA action on the oil code which sets up marketing rules covering garage equipment, primarily an automotive item, however, it looks as though each group in the industry will have to look out for itself. Otherwise Group A may find that Group B has filed a code and had it approved, which contains serious infringements of the territory which Group A regards as its own. The best answer to the problem, of course, would be some sort of coordinating agency set up by the industry itself. Lacking it, questions of infringements may not get too much attention before approval with the result that administration of the codes will cause numerous conflicts and will interfere unnecessarily with established sound business practices and channels of distribution.

While the law says that groups presenting codes shall be truly representative of their trade or industry, it is probable that it is going to be up to those whose interests are infringed by some section of a code presented by some other trade or industry, to show that insofar as this section is concerned, the trade or industry presenting the code is not truly representative.

New Machine for Quick Test of Extreme Pressure Lubricants

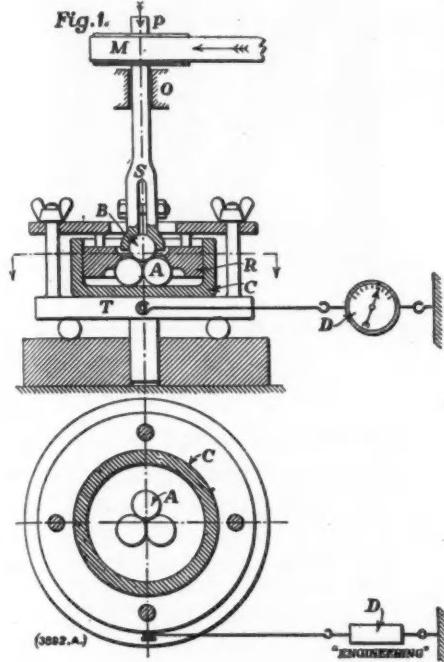


Fig. 1—Diagram of four-ball type of lubricant-testing machine

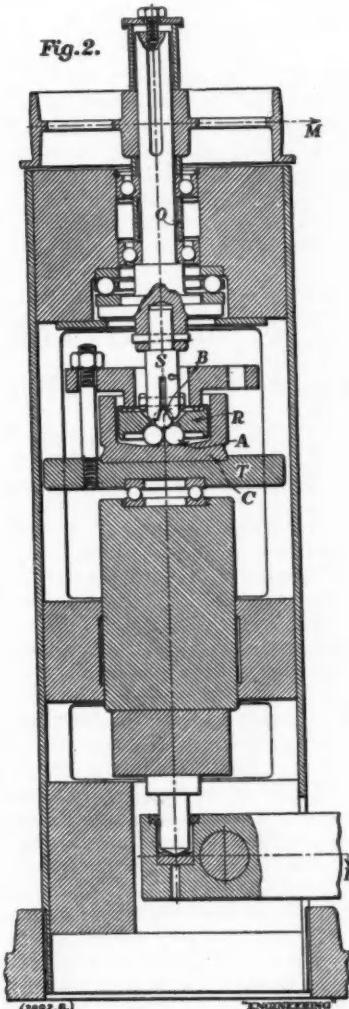


Fig. 2—Sectional view of lubricant-testing machine

A NEW "four-ball" lubricant testing machine specially designed for testing extreme-pressure lubricants has been described in *Engineering* by G. D. Boerlage of the Bataafsche Petroleum Company. Extreme simplicity and easy manipulation are claimed for the instrument, and results are said to be obtained with it rapidly and cheaply. Where absolute certainty is required it is suggested that the results be checked by a more scientific apparatus, such as that consisting of two cylinders at right angles to each other, both in rotation; but the four-ball method is said to be sufficiently accurate to make the instrument of real value for the preliminary determination and identification of E. P. lubricants.

The moving surfaces of the apparatus consist of bearing balls, which are very accurate in shape, of uniform material, inexpensive and easily obtained.

The principles of the apparatus are best seen in Fig. 1, which is diagrammatic, whilst the actual construction is shown in Fig. 2. Referring at the moment to Fig. 1,

the four balls are seen to be arranged in the form of a pyramid, three of them, *A*, being pressed tightly together by a conical ring, *R*, and on to the bottom of the cup *C*, which contains the oil under test. The fourth ball, *B*, rests on the other three, and is held in the cup-shaped end of a shaft, *S*. This shaft is automatically centered at the bottom by the three-point contact

of the lower balls, and is supported at the top in a bearing, *O*. The force, *P*, which produces the pressure on the balls, is applied downwards above the driving pulley, *M*, an electric motor being used for the drive. The friction of the balls tends to rotate the cup, *C*, which is carried on a table, *T*, itself supported on ball bearings. The torque on the table is measured by the spring dynamometer, *D*, shown in Fig. 1.

The four balls, which are $\frac{1}{2}$ in. in diameter, form, virtually, a foot-step bearing, and by the use of the instrument it is possible to select the oil most suitable for lubricating this bearing under given conditions of pressure and speed. Under severe conditions it may be taken for granted that cylinder oil will be useless, and that E.P.L. oils are necessary. In making the tests, however, care must be taken that the conditions under which they are carried out reproduce the pressures and speeds existing in actual gear practice. In experimenting with the apparatus, it has been run under many different conditions, the pressures, speeds, temperatures, and length of time of the test all having been varied. The quickest and most easily-obtained results were secured by determining, at a given speed, the highest pressure that a certain oil would stand for a run of one minute without permitting the balls to seize. Results showed that the best mineral and fatty oils will not stand an applied force, *P*, of 150 kg., whereas E.P.L. oils would easily stand, under the same conditions, a force of 300 kg. With specially-prepared oils, a force of as much as 800 kg. has been sustained.

Reference to Fig. 2 shows that the force, *P*, is applied to give the requisite pressure on the balls to the table, *T*, by means of a lever with an adjustable spring weight.

Cut in 20% Used Car Margin Considered at Preliminary Meetings on NADA Code

WASHINGTON, D. C.—A drastic reduction in the 20 per cent margin requested in the dealer's code, is not improbable following conferences between N.A.D.A. leaders and NRA preliminary to the public hearing on Sept. 18, according to reports current here. It is indicated that a 10 per cent figure may finally be adopted or a sliding scale with the percentage margin increasing as the car gets older.

There is a widespread feeling among the car makers that while a 20 per cent margin may be justified on rational grounds, when taken in conjunction with probable increases in list prices, the jump in what the public will have to pay for new cars will be so big as to stall the market. This situation is discussed in the leading article in this issue. The result of any trading policy affecting volume adversely would be, of course, to curtail employment both by dealers and manufacturers.

It is understood that the clause forbidding discounts on parts except to authorized outlets also is coming in for criticism at the preliminary meetings. This prohibition would affect not only independent repairshops but also fleet owners and insurance companies.

There is also a report that Thomas J. Hay, representing the National Used Car Market Report, will appear to urge that the compilation of the used car allowance guide be entrusted to an independent agency on the ground that the N.A.D.A. is a party at interest and that the public interest would be served better by having an outside organization do this work.

A. F. of L. May Force Ford on Bargaining

DETROIT—No statement has been forthcoming from the Ford Motor Co. on its position on the automobile code, despite expectations in some quarters that Henry Ford would have something to say following his return from Northern Michigan early this week. Meanwhile, in response to almost daily questions, General Johnson has indicated that so far as he knew the Ford company was abiding by the code and that no action would be taken until there was evidence of violation.

Meanwhile reports from Washington indicate that the American Federation of Labor is not anxious for any action at this time. They would prefer to undertake organization of Ford workers first and when that job is complete, ask the Ford Motor Co. to receive representatives of the union for the purposes of collective bargaining. If the company refused to

receive such representatives, action on the issue would then be demanded.

Meanwhile it is reported that Ford is taking no action on a company union to forestall action by outsiders such as the A. F. of L., as many other manufacturers within the industry are doing.

\$955,000,000 for Roads

WASHINGTON, D. C.—State highway expenditures in 1932 amounted to \$955,446,000 according to information collected from State authorities by the Bureau of Public Roads, U. S. Department of Agriculture.

NACC Members Triple August, 1932, Output

Chamber Companies Now 18 Per Cent Ahead of 1932 Total Production

NEW YORK—August operations of members of the National Automobile Chamber of Commerce accounted for an output of 171,145 units, or 213 per cent over the output for the corresponding month in 1932, according to the Chamber's preliminary estimate.

The Chamber estimate includes all the major producers in the industry except the Ford Motor Co. Its output is believed to have approximated 60,000 which would make the industry total for the month about 230,000 as compared with 239,628 in July and 49,392 in August, 1932.

This placed the production of Chamber members for the eight months of this year at 1,153,402 cars and trucks. By comparison, this was greater than the output of the entire industry for the same period last year (1,122,124)—and an increase of 45 per cent over the Chamber output for the same period in 1932 (793,655 units).

It was also an increase of 18 per cent over the Chamber output for the entire twelve months of 1932 (977,134).

While August operations showed a decrease of 3.4 per cent under the preceding month, this seasonal decline was much smaller than that experienced in any corresponding period since 1929.

Production of Chamber members is summarized below:

August, 1933	171,145
July, 1933	177,080
August, 1932	54,666
8 Months, 1933.....	1,153,402
8 Months, 1932.....	793,655
12 Months, 1932.....	977,134



Expansion in Motor Earnings Predicted

As a temporary condition, brought about by wider employment and higher wage and material expenses, earnings of car builders will be moderately curtailed as a result of adherence to the code. Adequate price adjustments to absorb these cost increases are likely to take effect with introduction of 1934 models, however. More important than this prospect, nevertheless, is the belief that the longer term expansion in auto sales should far more than offset the current narrowing of profit margins.—Standard Statistics, Inc.

"Merit" Clause Fight Not Finished Yet

WASHINGTON, D. C.—General Johnson's decision that the "merit" clause in the N.A.C.C. code, would not be included in any codes approved in the future, raises a question as to the fate of this controversial language when the N.A.C.C. code comes up for renewal at the end of this year.

General Johnson is understood to have told the car makers in private conferences that the language of the Act did not mean that they could not operate open shops. When asked what objection there was to saying so in the code, he is reported to have replied that it was unnecessary. A factor in the final agreement to permit the inclusion of the revised "merit" clause in the code is believed to have been that the car makers asked nothing in the way of anti-trust law relaxation in their code, confining themselves simply to hours and wages. Proponents of many other codes asking more or less comprehensive regulatory powers were not in the same position to stand firm on this point.

NEWS

Retail Car Sales Expected to Total 150,000; Output Begins to Taper Off

New Model Introduction in Next 30 Days May Not Have Usual Influence on Sales due to Delay in Getting Body Production Under Way

By Athel F. Denham
Field, Editor, Automotive Industries

Beecroft to Advise NRA

WASHINGTON, D. C.—David Beecroft of the Bendix Aviation Corp. has been appointed industrial adviser to NRA on the code filed by Automotive Parts and Equipment Manufacturers, Inc., Edward R. Stettinius,



David Beecroft

liaison officer between industry and NRA, announced this week. Mr. Beecroft is widely known throughout the industry, being a past-president of the S.A.E. and at one time a vice-president of the Chilton Class Journal Co.

Chevrolet-BOP Merge Parts Warehouses

DETROIT—Consolidations of Chevrolet and B-O-P parts warehouses are now being effected on a national scale by General Motors. The net result will be a major reduction in parts distribution costs. The move will also provide B-O-P dealers with somewhat better distribution facilities than formerly.

It is understood that dealers handling Chevrolet, Buick, Oldsmobile and Pontiac cars now receive the full dealer discount on parts purchased from the warehouse for any of these four lines.

Automotive Industries

DETROIT—Retail domestic deliveries during September should total in the neighborhood of 150,000 passenger cars as compared with 175,000 in August and approximately 80,000 in September of last year. This decline, while representing the first major drop in retail deliveries since last March, is no more than a normal seasonal decline.

Daily production is expected to fall off materially toward the latter part of the month with some plants shutting down entirely for model change-over and dealer stock cleanup. Stocks of new cars in the hands of dealers continue to average at low levels in proportion to new car movement indicating that clean-ups this year will present but little difficulties.

It is not expected that the introduction of new models by several manufacturers during the next 30 days will influence the sales picture as much as usual, since considerable difficulty is being experienced in getting cars into production, particularly with reference to bodies. Much of this is due to inability to speed up die and tool production under the working hour provisions of the NRA apparently.

Individual company reports follow:

Graham retail deliveries are holding close to July levels although slightly behind the peak reached in August. An increase in production over original September schedules is in prospect.

Pierce-Arrow shipments for August were 85 per cent greater than shipments for the corresponding month a year ago. Further increases are expected in September, reports from distributors reflecting a continued improvement in retail sales.

For the third consecutive month production of Hupp Motor Car Corp. showed a marked increase over the previous month in percentage of gain over the corresponding month of 1932, according to Rufus S. Cole, vice-president in charge of sales.

August, with a production total of 675 units, was more than double August of last year, while July was 62 per cent and June 19 per cent ahead of the same month last year. The gain for the last three months combined was 52 per cent.

Exports also show a constant gain in the last three months, with a gain of 81 per cent for this period. Export totals for the year to date are 36 per cent ahead of 1932.

Retail sales of Plymouth cars for the week ended Sept. 2 broke all company records, according to H. G. Moock, Plymouth general sales manager.

During this week 7594 Plymouth cars were delivered. This was 7.7 per cent over the previous week, and 307 per cent greater than the same week of last year.

Oldsmobile's September production schedule calls for four times as many units as were produced in September of last year.

Domestic retail sales of Chevrolet cars and trucks as reported by dealers for August were 68,650, an increase of 39,420 units or 134 per cent over the same month in 1932, according to H. J. Klingler, vice-president and general sales manager of the company.

Total sales for the year to Sept. 1 were 441,405 units against a total for all of 1932 of 378,811. Thus the sales for eight months of 1933 exceed those of 12 months of 1932 by 62,594 or 16.5 per cent. The original sales objective for this year was set at 450,000 cars and trucks.

August sales of Buick, Oldsmobile and Pontiac cars maintained the fast pace set during the previous months, with each of these cars showing a decided increase over August of last year, W. A. Blees, B-O-P general sales manager reported this week.

Pontiac sales during August were more than 200 per cent greater than during August of last year; Oldsmobile sales were 115 per cent greater than for the same month last year and Buick sales were up 69.53 per cent over August, 1932.

Though August deliveries usually decline from July, sales of these three cars were only slightly under July of this year, Mr. Blees reported.

Reo Sedan at \$795

DETROIT—Reo announces addition of a standard sedan to its Flying Cloud six line priced at \$795, the lowest price ever put on a Flying Cloud. It is available in two color options, has safety glass in windshield and five demountable wheels carrying 6 x 17 tires. The deluxe sedan differs from the standard in provision of cigar lighter, fender wells, assist cords, twin horns instead of one twin, visors and two wipers instead of one each.

September 16, 1933

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

The unavoidable unsettlement in some quarters pending the adoption of specific codes continued to have a retarding influence on trade last week; but, nevertheless, business activity has broadened under the impetus of fall buying. The recession in some of the larger industries was not so pronounced as in the preceding few weeks. Some idea of the gains in industry and trade in recent months may be gained from the fact that steel production during the first eight months of this year was larger than that during the whole of 1932.

Retail Trade Optimistic

Sales of one large mail order house during August were 20.5 per cent above those a year ago, although the gain during the first seven months of this year, as compared with the total for the corresponding period last year, amounted to only 1.5 per cent. Sales of one large store chain during August were 32.1 per cent above those a year ago.

Car Loadings Reach New Peak

Railway freight loadings during the week ended Sept. 2, totaled 666,652 cars, which was the highest for any week so far this year. The total during the week ended Sept. 2, showed an increase of 34,654 cars above that during the preceding week, an increase of 105,327 cars above that a year ago, but a decrease of 98,219 cars below that two years ago.

Commercial Failures Down

According to Dun & Bradstreet, Inc., commercial failures during August totaled 1472, the lowest for any August since 1925, as against 2796 a year ago. Liabilities involved in the August failures amounted to \$42,776,049. While the August liabilities were below those a year ago, they compared with a total of only \$27,481,103 during July.

Power Production Increase

Production of electricity by the electric light and power industry in the United States during the week ended Sept. 2, was 11.8 per cent above that during the corresponding period last year.

Commodity Prices Slowly Rise

Fisher's index of wholesale commodity prices during the week ended Sept. 9 stood at 70.9, as against 70.8 the week before and 70.4 two weeks before.

Banks More Active

The consolidated statement of the Federal Reserve banks for the week ended Sept. 6, showed a decrease of \$8,000,000 in holdings of discounted bills and an increase of \$37,000,000 in holdings of Government securities. Holdings of bills bought in the open market remained unchanged. The reserve ratio on Sept. 6 stood at 67.0, as against 67.5 the week before and 67.9 two weeks before.

Continental Adds to Dealer Organization

DETROIT—Henry Krohn, vice-president in charge of sales of Continental Automobile Co., has announced that during July 65 new accounts were added to the dealer organization and the latest count for August shows between 70 and 80. Although some of these are associate dealers in cities already covered by a direct dealership, among the more important cities in which Continental cars are now represented for the first time are, Toledo, Spokane, New York City, Boston, Philadelphia, Kansas City, Kansas, Columbus, Ga., Springfield, Mass., Buffalo, Waco, Galveston,

Lafayette, Ind., Paducah, Ky., and Davenport, Ia.

Active dealers now are operating in more than 150 cities in the United States according to Mr. Krohn.

At present there are 65 overseas distributors in 45 foreign countries, with approximately 200 unfilled orders for overseas shipments, Mr. Krohn further stated.

Knight Resigns

CHICAGO—Boyce W. Knight, for many years vice-president in charge of sales for the Ensign Carburetor Co., Ltd., has recently tendered his resignation. His future plans have not yet been announced.

M.E.M.A. Sets Date for Annual Meeting

Snively Succeeds Boynton on Joint Show Committee

NEW YORK—The annual convention of the Motor and Equipment Manufacturers Association will be held in Chicago on Oct. 31, according to plans announced by President George L. Brunner of the Brunner Mfg. Co. The meeting will come during the week of the Automotive Service Industries Show which is scheduled to be held in the Merchandise Mart, Chicago, Oct. 30 to Nov. 3, inclusive. Convention sessions will be preceded by a meeting of the MEMA board of directors on Oct. 28 and will be followed by a meeting of the newly-elected board on Nov. 2. Meetings will be held at the Blackstone Hotel, official MEMA headquarters during show week.

President Brunner has appointed V. J. Snively of the McAleer Mfg. Co., Detroit, as an MEMA representative on the show's Joint Operating Committee to succeed N. H. Boynton of the General Electric Co., Cleveland, who has been unable to serve.

C. W. Schwank of the R. M. Hollingshead Co., Camden, N. J., was named as an additional member of the MEMA Chemical Specialties Committee which is headed by G. W. Sherin of E. I. DuPont de Nemours & Co., Wilmington, Del.

August 21.8 Per Cent Better for Cadillac

DETROIT—August deliveries of Cadillac cars were 21.8 per cent better than Aug. 1932, and the fact that the last ten days of August were 41.7 per cent better than the same period of Aug. 1932, indicates a continuation of better business into the fall months.

Although new car deliveries have been much higher than last year for the past three months, used car stocks in the hands of dealers have been well below the same periods of 1932, and at the end of August were only 60 per cent of what they were Aug. 31, 1932.

Chrysler August Exports at Highest Level Since '29

DETROIT—During August Chrysler Motors shipped more passenger cars and trucks overseas than during the same period in any year since 1929, according to figures announced by W. Ledyard Mitchell, chairman of the board of the Chrysler Export Corp. August 1932 passenger car shipments were 268.74 per cent of similar shipments in Aug. 1932, and trucks were 537.63 per cent of the same period in 1932. Passenger cars and truck shipments combined for August were 299.38 per cent of total August shipments last year.

Ford Plans Large September Output

DETROIT—Production of Ford cars and trucks in September has been scheduled at the same high daily rate as in August, according to an announcement from the Ford Motor Co. August production was the greatest for the year to date.

August retail deliveries of Ford cars and trucks reached the greatest volume for the year thus far and were 41 per cent greater than Aug. 1932, indicating the rising volume of Ford sales during the summer.

The retail sales volume of Ford passenger cars in August was the largest since June 1932 and the retail sales volume of Ford trucks the greatest since Oct. 1931. The daily sales

volume in August is being maintained in September, the report stated, on the basis of reports of sales by dealers for the first six business days of the month.

W-O Gets New IHC Order

TOLEDO—Another order for 2500 half-ton trucks of the Model D-1 and 2000 engines has been received from the International Harvester Co., by receivers for the Willys-Overland Co., according to a report of L. A. Miller, receiver, to federal court this week.

Mr. Miller reported that sales of passenger cars had been quite satisfactory in the last few weeks.

Orders on hand are expected to keep the plant here operating on its present schedule into 1934.

No NRA Planned for Canada, Bennett Says

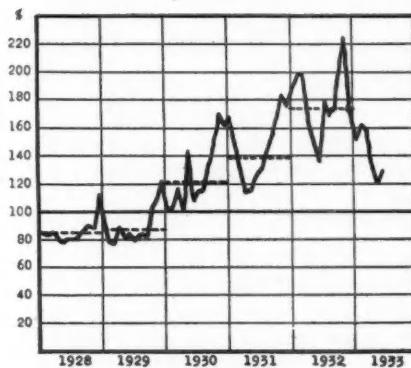
Wages and Hours to Remain Matter of Private Concern

TORONTO—Executives of the automotive industry in the Dominion are more at rest following the announcement of Rt. Hon. R. B. Bennett, Prime Minister, that the Canadian Government will not follow the example of any other country in the adoption of a National Recovery drive. If any such measure is adopted with regard to wages, hours or employment it will be a matter of private concern, he has intimated, and the Government will not be a party, officially or otherwise.

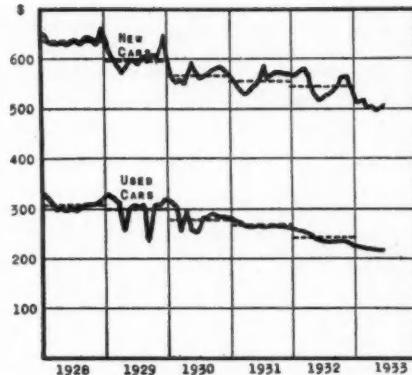
This pronouncement followed complaints that enterprises in the Dominion having parent companies in the States were carrying out further operations in a move to avoid NRA requirements in the Republic. It was claimed that Canadian workers were being increasingly burdened with orders and production for both domestic and export trade without securing the advantages of increased pay, shorter hours and widened employment as incorporated in NRA codes. The Canadian Government has not officially recognized the alleged grievance although the City Council of Windsor, Ontario, has placed a boycott on those factories within its jurisdiction which have not followed parent companies in the States in adopting apparent benefits under the National Recovery administration.

Prime Minister Bennett has said that industrial conditions in Canada are showing substantial improvement and will probably continue to do so without recovery stimulant. It is also generally expected that, because of the close contact of the two countries, upward trends in the United States will naturally be reflected in Canadian conditions without delay. The psychological effect of the NRA movement will permeate the Dominion because of the direct industrial relationship, it is believed. Further, it is pointed out that the United Kingdom is well on the road to recovery without organized effort and Canada will not be far behind the Mother Country.

Further Drop in Ratio of Used to New Car Financing Predicted After Big Decrease in First Six Months



Used cars financed in per cent of new



Average value of instalment notes

The full line in each chart shows the monthly movement while the dotted line denotes the average for the year

CHICAGO—The ratio of used to new cars financed dropped to 137.6 per cent in the first six months of this year from the 1932 average of 174.2 per cent according to the National Association of Finance Companies from whose bulletin the accompanying charts are reproduced.

The decrease in this ratio which increased steadily from 1928 through 1932, is attributed partly to the increase in new car sales and partly to the fact that on the average cars in use are older and fewer of them are suitable for trade-in purposes. The latter reason tends to increase the percentage of clean deals and also to reduce the amount of trading down dealers have to do finally to liquidate their used car investment, both of these factors obviously operating to reduce the amount of used car business done for a given volume of new

car sales. N.A.F.C. considers it probable that the ratio of used to new financing will continue to show decreases for some time to come.

The changes in this ratio are portrayed in one of the accompanying charts. The average figure for each year is shown by the dotted line while the full line shows the monthly variations.

The average value of the notes covering time sales of both new and used cars, have been declining steadily for more than five years as the other chart shows. The downward trend is due to the continuous decline in selling prices and to the increasing popularity of the lower-priced cars. Comparison of these curves with average new car prices indicate that there has been some decrease in the average down payment.

N.S.P.A. Adds 16

DETROIT, Sept. 8—Sixteen new names have been added to the membership roster of the National Standard Parts Association. Included are 11 jobbing firms and five manufacturing concerns. The new manufacturer members are Dorman Star Washer Co., Cincinnati; Edison-Splitdorf Corp., West Orange, N. J.; Eis Mfg. Co., Inc., Bronx, N. Y.; Weatherhead Co., Cleveland, Ohio; Weber Tool Mfg. Co., Los Angeles, Calif.

Strip and Sheet Prices Advanced

New Pricing Nomenclature to Be Based on Dimensions

NEW YORK—Following several unavoidable postponements, the American Iron and Steel Institute is now rushing compilation of the industry's statute laws.

Dimensional characteristics of the finished products are to be the governing factor in the new nomenclature; all reference to the process of production and the use to which the finished steel is to be put is to be eschewed. Thus a flat steel is designated as strip or sheet or plate, no matter whether it has been rolled in a sheet, strip or plate mill; thickness, width, etc., being the sole basis of differentiation.

For the time being, price changes apparently are being made public in the manner heretofore in vogue, the leading mid-western "independent" having just announced an increase of \$2 and \$3 per ton in fourth-quarter prices for hot and cold rolled strip and of \$2 a ton in the fourth-quarter price of No. 10 gauge hot-rolled sheets, other mills immediately adopting this upward revision of prices, based as all price changes now are on previous notice to the Institute.

With automotive consumers furnishing specifications against third-quarter contracts to the very last ton coming to them at old prices, mills were able to operate at a higher rate this week. The unfilled tonnage statement of the leading interest, made public on Saturday and showing a decrease of 129,681 tons in August was interpreted in the steel market as denoting a healthy state of affairs, the shrinkage being ascribed to the absence of any incentive for forward commitments, price concessions no longer being available



Russel Paige, new Dodge director of parts and service, succeeding D. T. Stanton, who has been assigned to special work on General Sales Manager van-DerZee's staff. Mr. Paige formerly was general sales manager of Canadian Dodge.

to buyers, in spite of which fresh orders were booked in sufficient volume to offset within a hundred thousand tons the heavy rate of shipments.

Pig Iron—The markets generally rule quiet, automotive foundries taking in iron as called for by their melting schedules.

Aluminum—Demand continues fair amid steady market conditions.

Copper—The market is devoid of new features and pricewise unchanged. Connecticut Valley fabricating plants have a fair run of automotive business, but forward buying is not as much in evidence as the probability of higher copper prices later in the year had led the industry to hope for earlier in the summer.

Tin—The market for prompt Straits opened firmer this week at 45½c., ¾c. higher than the preceding week's final price and made further gains on Tuesday.

Sloan Tells Stockholders About Consumer Research

NEW YORK—Consumer research activities of the General Motors Corp. are discussed by President Alfred P. Sloan, Jr., in a letter sent to stockholders this week. "We no longer can depend," Mr. Sloan says, "on casual contacts and personal impressions—our business is too big; our operations too far-flung.

"We are passing through a kaleidoscopic era characterized by swift movements—social as well as economic—and such conditions cannot fail to bring more rapid changes in the tastes, desires and buying habits of the consuming public. So it becomes increasingly important that we provide the means for keeping our products and our policies sensitively attuned to these changing conditions.

"And, irrespective of what these changes may be—regardless of what the new economic and social order may hold—I am confident that a more intimate, detailed and systematic knowledge of the consumer's desires will afford the corporation a sound and progressive basis upon which to meet the new conditions as they unfold."

The letter also refers to the impending twenty-fifth anniversary of the company.

A.P.E.M. Hearing Date Expected This Week

DETROIT—Preliminary conferences with NRA have been held on the A.P.E.M. code for the parts industry, it is reported here. Public hearing date is expected to be set by Sept. 16, indicating a good possibility that the code will become effective around the end of the month.

Wholesale Financing at Two-Year High; Retail Volume Near June Peak

WASHINGTON—July wholesale financing totaling \$58,308,782 was at the highest level in two years, according to the Census Bureau reports on the operations of 282 identical finance companies. Retail dollar volume of new car paper also reached the highest figure since August, 1931, despite the fact that the number of new cars financed declined slightly from 84,358 in June to 84,282 in July.

Used car financing in July ran slightly behind June both in dollars and units but was larger than in the same month a year ago.

For the first seven months, wholesale financing was up 21.3 per cent from the same period in 1932, while total retail financing declined 9.6 per cent in dollars and 6.6 per cent in units. The larger decline in dollar volume undoubtedly is due to the

lower average prices prevailing. New car retail financing, however, was 9.5 per cent higher in units and 2.3 per cent larger in dollars. The number of used cars financed dropped 15.8 per cent and the dollar volume 24.4 per cent. The decrease in retail financing therefor was due entirely to the shrinkage in used car paper.

The following table gives detail comparative figures:

Year and Month	Wholesale Financial Volume in Dollars	Number of Cars	Retail Financing											
			Total				New Cars				Used Cars			
			Volume and Average		Volume and Average		Volume and Average		Volume and Average		Volume and Average		Volume and Average	
Year and Month	Wholesale Financial Volume in Dollars	Number of Cars	Total Amount	Per Car	Number of Cars	Total Amount	Per Car	Number of Cars	Total Amount	Per Car	Number of Cars	Total Amount	Per Car	Number of Cars
July, 1932.....	\$26,016,028	132,467	\$44,716,907	\$338	45,816	\$24,149,326	\$527	82,687	\$19,225,478	\$233	3,964	\$1,342,103	\$339	
June, 1933.....	56,937,616	185,286	65,514,154	354	84,358	43,004,313	510	96,741	21,181,515	219	4,187	1,328,326	317	
July, 1933.....	58,308,782	182,222	65,314,765	357	84,282	43,333,572	514	93,930	20,542,189	219	4,010	1,259,004	314	
First seven mos., 1932	244,450,165	1,017,537	363,343,179	357	369,956	201,891,689	546	617,852	151,640,219	245	29,729	9,811,271	330	
First seven mos., 1933	296,447,401	948,975	328,194,186	346	405,720	206,672,612	510	520,858	114,492,675	220	22,402	7,028,899	314	
Per cent change.....	+21.3	-6.6	-9.6	-3.1	+9.5	+2.3	-6.5	-15.8	-24.4	-10.1	

Repairmen Attend Code Meeting in Washington

WASHINGTON, D. C.—A meeting of representatives of various factions seeking to obtain recognition as the national association for independent repairmen and garages, was held in Washington Sept. 11, 12 and 13. It developed a code for that industry and presented it to the NRA, at the same time applying for temporary exceptions to the labor provisions in the President's Reemployment Agreement.

The meeting was called by the A.A.A. at the suggestion of the NRA it is said.

The code provides a 48 hour work week for mechanics and a 56 hour work week for night men, porters and other unskilled labor. It provides a minimum hourly rate of 50 cents for mechanics. Under trade practices, the code makes all of the unfair trade practices condemned by the Federal Trade Commission "a violation of the code."

Car owner interests as represented by the Franklin Automobile Company through a provision under "prices and costs," that nothing in the code pertaining to the sale of merchandise or service below cost shall be construed to deprive anyone from the right to contract for the handling of emergency road service "at reasonable rates with recognized organizations of automobile owners."

A.A.A. interests are further protected in the code by an exception in the section under maximum hours which provides for the employment of men "as on call" for an unlimited period between 6 p. m. and 7 a. m. at a rate of time and one-third for actual hours of labor in excess of 48 hours weekly.

Efforts to form a national independent repair and garage association were unsuccessful.

New Franklin Airman

SYRACUSE, N. Y.—A new Franklin Airman line has been announced by the Franklin Automobile Company. It appears in three models, five- and seven-passenger sedans, and a five-passenger club sedan, all on a 132-in. wheelbase. The base price of the line is \$2185. Bodies have been redesigned, following the lines of the Franklin Twelve. The engine is supercharged from the cooling blower, as in the Twelve.

U.S. Asks 16,000 Truck Operators for Facts

WASHINGTON, D. C.—Sixteen thousand truck fleet operators are being sent questionnaires by Federal Coordinator of Transportation Joseph B. Eastman. The group includes for-hire carriers as well as private operators of 10 or more vehicles who handle

their own goods in their own or rented trucks. The inquiry is for the purpose of investigating the relation of motor trucking to freight transportation and determining the sphere in which the transportation of goods by motor vehicle is more economical or serviceable than by other means of transportation.

Dascoloy Becomes Krokoloy

DETROIT—Because of the similarity of the name "Dascoloy" to the name of another trade-marked alloy, the Detroit Alloy Steel Co. has decided that its chrome cobalt alloy tool steel cast to shape hereafter will be known as "Krokoloy."

Herrick With Johnson

NEWCASTLE, PA.—Edward D. Herrick, formerly chief engineer of the Lycoming Mfg. Co., has been appointed vice-president in charge of sales of the Johnson Bronze Co.

Palmer Leaves Industry

NEW YORK—Walter T. Palmer has been appointed general sales manager of Schenley Distillers Corp. Mr. Palmer for the last 12 years has been sales manager of the brake lining replacement division of Russell Mfg. Co.

Gov. Herring Adviser at Dealer Code Hearing

WASHINGTON, D. C.—Clyde L. Herring, Governor of Iowa, has been named industrial adviser to NRA for the hearing on the code filed by the National Automobile Dealers Association,



Gov. Clyde L. Herring

scheduled for Sept. 18. Governor Herring is one of the best-known men in the automotive trade, having been a pioneer Ford distributor for Nebraska and part of Iowa. He is also the founder of the Herring-Wissler Co., one of the country's large automotive jobbing establishments.

Trailer Makers Ask Broad Control Power

Code Would Give Authority Over Terms and Trade-Ins

WASHINGTON, D. C.—Trailer sales will be subject to comprehensive and in some respects rigid control as to prices, credits, discounts and trade-ins if the code of fair competition of the Trailer Manufacturing Industry is approved by NRA as filed. The Trailer Industry, as defined, includes truck makers producing trailers.

One of the most drastic rules in the code brands as unfair competition "To sell or permit to be sold trailer assemblies or parts for the building of trailers to persons, firms or corporations except such persons, firms or corporations as shall have been actively engaged in the building of trailers for resale on Aug. 1, 1933." The effect of this rule apparently would be to prevent the entry of any new manufacturing enterprise into the trailer field unless it was prepared to build trailers from the ground up without recourse to axle, bearing, wheel, tire and other specialty manufacturers outside of the trailer industry and coming under NRA codes of their own industries.

The code also calls for a minimum down payment of 25 per cent on time sales and the balance in equal payments spread over not more than 18 months. Interest and finance charges on the unpaid balance are to be not less than a half per cent a month or if interest bearing notes are accepted, the charge must not be less than $\frac{1}{4}$ per cent per month. Demonstration of trailers for more than 72 hr. or loaning them is forbidden. Sales below cost also are barred, cost being defined as labor and material plus overhead based on reasonable volume. Trade-ins are to be made at the realizable value of the old equipment and the allowance must not exceed 30 per cent of the sale price of the new equipment. Another clause bars selling trailers with a rated capacity in excess of axle capacity limits. Price lists must be filed. A complete schedule of discounts to different classes of buyers also is set up ranging from 30 per cent plus 10 per cent for cash in 30 days to factory branches, distributors and trailers manufacturers down to nothing except 5 per cent for cash in the case of fleets of nine or less units.

Basic hours are set at 40 average and minimum wages ranging from 30 to 40 per cent on the population basis, except that the 30 cent minimum applies everywhere in 11 Southern States.

For office and salaried employees, minimum pay follows the population groupings and rates of the President's blanket reemployment agreement.

General Motors Has Biggest August Since 1929 Despite 9% Drop From July

U. S. Dealer Stocks Decline—Corporation More than 40,000 Ahead of 1932 Full Year Total—Foreign Sales Double Total in August Last Year

NEW YORK—August sales of General Motors cars and trucks to dealers reached the highest totals for that month since 1929 while sales to consumers fell only 54 units short of August, 1930, exceeding 1931 and 1932 by substantial margins. Shipments in the first eight months of 1933, moreover, were more than 40,000 in excess of 1932's full year total.

The corporation sold 97,614 cars and trucks in August to its world dealer organization. This total represents a decline of 9 per cent from the July figure of 106,918 and an increase of 220 per cent over August, 1932, when shipments numbered 30,419. For the first eight months of 1933 shipments were 52 per cent ahead of the same period last year, the respective totals being 703,154 against 462,206.

Sales to consumers in the United States also declined in August but the loss amounted only to one per cent, from 87,298 in July to 86,372. Compared with August, 1932, when deliveries amounted only to 37,230, an increase of 132 per cent is shown. Total retail deliveries in the United

States amounted to 573,434 in the first eight months, a gain of 38 per cent over the 415,653 delivered in the same period last year.

A decline of nine per cent in sales to U. S. dealers is reported in August as compared with July, the respective totals being 84,504 and 92,546. As compared with the August, 1932, total of 24,151, however, a gain of 250 per cent is shown. For the year to Aug. 31, total sales to U. S. dealers amounted to 604,812 against 396,998 last year, an increase of 52 per cent.

The figures reflect an increase in U. S. dealer stocks of 31,378 in the first eight months with August showing a decrease in field inventories of 1,868 units.

Sales to Canadian and overseas dealers in August totaled 13,110, a decline of 9 per cent from July when shipments amounted to 14,372 units, but an increase of 109 per cent over the August, 1932, total of 6268. In the first eight months foreign sales amounted to 98,342 against 65,208 last year, a gain of 50 per cent.

Comparative data on the corporation's sales follows:

	Aug., 1933	July, 1933	Aug., 1932	1933	1932
World sales to dealers.....	97,614	106,918	30,419	703,154	462,206
Sales to U. S. dealers.....	84,504	92,546	24,151	604,812	396,998
Sales to U. S. consumers.....	86,372	87,298	37,230	573,434	415,653
Change in U. S. dealer stocks....	-1,868	+5,248	-13,079	+31,378	-18,655
Sales to foreign dealers.....	13,110	14,372	6,268	98,342	65,208

Nesbitt Slayers Get Life

DETROIT—The four confessed kidnappers and killers of Joseph Nesbitt, 45 years old, service manager for the Autocar Sales and Service Co., were sentenced Sept. 9 to serve from 45 to 90 years for kidnapping and life imprisonment for murder, the sentences to run concurrently.

The Autocar Sales and Service Co. is engaged in the sale and servicing of trucks, and is located at 290 Piquette Ave.

The kidnapping and shooting took place on the night of Sept. 7. Mr. Nesbitt died the next morning.

Graham Exports Up 40%

DETROIT—As a result of a sharp increase in volume since early July, export shipments of the Graham-Paige Motors Corp. for the first eight months of the year were 40 per cent greater than in the same period of 1932, according to Robert C. Graham, executive vice-president. Foreign ship-

ments in July and August were virtually double that of the same two months in 1932.

European buying continues to be the mainstay of Graham exports, but South America is showing signs of vigorous improvement.

Toledo Plants Report Gains

TOLEDO—Plants supplying parts and equipment for the automotive industry here are showing gains in business.

The City Auto Stamping Co., has booked substantial orders for its die division indicative of early work on new models. Amos Lint, president, announced that 50 skilled men will be recalled to this work. The company has about 300 employed in its stamping plant.

Business of the Electric Auto-Lite Co., increased 28 per cent in August over the preceding month and about 60 per cent above the same month last year, according to C. O. Miniger, president. However, it was under

August business of 1929, 1930 or 1931. Employes have been given a 10 per cent raise in wages and schedules have been revised to conform to the proposed NRA code which is not yet completed for this industry.

Spicer Manufacturing Corp., is booking new business and has received a good response from manufacturers on its new self-operating clutch and shock absorber.

New York and Chicago Show Applications Are Mailed

NEW YORK—Application for space in the thirty-fourth annual national automobile shows to be held in Grand Central Palace, New York, and the Coliseum, Chicago, were mailed this week. At New York, the first two floors will be devoted exclusively to motor vehicle exhibits with a part of the third floor available for this purpose also. At Chicago, the motor vehicle displays will occupy the main floor, the north hall and so much of the south hall as may be required.

Monday and Tuesday will be trade days at both shows and on them persons actually engaged in the industry will be admitted free between the hours of 10.30 a. m. and 1.30 p. m.

Russell Back Without British Line of Cars

TORONTO—T. A. Russell, president of Willys-Overland Limited, Toronto, has returned from the United Kingdom without obtaining the Canadian manufacturing franchise for a line of British cars for which he negotiated on his recent trip to British centers.

With the closing down of the Canadian Overland plant on June 1, following the receivership of Willys-Overland in the States, President Russell indicated a desire to resume operations with the manufacture of a British car for the Canadian and other markets. It is understood that British manufacturers preferred to exercise direct control of production activities.

French Diesel Locomotive Shows High Average Speed

WASHINGTON, D. C.—A new type of electric Diesel locomotive has just been put in operation on the Paris-Lyon-Méditerranée Railway, according to Consul Robert D. Murphy, Paris, in a report made public by the Commerce Department. The locomotive which is attracting considerable attention represents an important departure in railroad operation in France.

On a trial run from Paris to Marseille, a distance of approximately 535 miles, the run was made in less than nine hours at an average speed of 62 miles an hour.

Lycoming to Make Controllable "Props"

WILLIAMSPORT, PA.—The Smith controllable pitch propeller for airplanes is to be manufactured by the Lycoming Manufacturing Co. under license of the Smith Engineering Co., Cleveland, which was recently purchased by the Cord Corp. Equipment of the Smith Engineering Co. will shortly be moved from Cleveland to the Lycoming plant.

Plymouth Has Best August

DETROIT—H. G. Moock, general sales manager of the Plymouth Motor Corp., has announced that the month just ended was the best August in the entire history of the company, with a total of 33,626 cars shipped to dealers, more than five times the number of cars shipped during August, 1932.

Plymouth sales during the first seven months of this year were 77 per cent greater than during the same period of 1932. This increase was more than five times greater than the gains of Plymouth's nearest competitor in the low price field.

Many dealers have reported the greatest used car business last week in their history, according to Mr. Moock.

Labor Names Three to Detroit NRA Board

DETROIT—Frank X. Martel, president of the Detroit Federation of Labor, Daniel O. Collins, member of the city Water Board and George Krogstad, labor leader, have been nominated by the Federation to represent it on the NRA board of conciliation. Employers are to have three representatives on the board as are consumers.

AC Sales Up 185%

FLINT—A C. Spark Plug Co. has reported an August sales gain of 185 per cent in dollar volume and a payroll increase of 230 per cent over August a year ago. August sales equalled those of July this year. Employment approximated 4000 workers, an increase of 70 per cent over August last year. Present unfilled orders are substantially higher than those of a year ago, Harlow H. Curtice, president, stated.

FIAT Gets Budd License

PHILADELPHIA—The Edward G. Budd Manufacturing Co. has granted the FIAT Automobile Co. of Italy a license to use its patents, experience, and future developments for the construction of all-steel bodies under a royalty agreement.

Automotive Oddities—By Pete Keenan

Write us if you
know an Oddity



SIGN ON YORK RD.
(U.S. 111.)
Near Baltimore,
Md.



CARS OF A YELLOW GREEN ARE TABOO IN INDIA. It is a sacred color only worn on turbans of those who have made the journey to Mecca.



Federated Truck Associations Protest Effects of "Basing Point" Plans in NRA Codes on Motor Haulage

WASHINGTON, D. C.—Transportation provisions of the cane sugar code, to which attention was drawn in *Automotive Industries* last week, have been protested by the Federated Truck Associations of America, Inc., in a brief just filed with the Agricultural Adjustment Administration.

Special licenses to be issued truck transport by the Agricultural Adjustment Administration, surcharges on motor haulage, and a series of complicated factors to be exercised by the Board of Directors of the Sugar Institute where truck shipments of sugar are permitted would be employed in the efforts to keep sugar out of the trucks and up to the "delivered prices," the Federation states.

"The 'basing point' practices in the sugar, cement, steel, and perhaps other codes, already have, or are designed to 'stabilize' prices at an arbitrary cost to the consumer, according to the truck owners organization," the Federation continues.

"The first of the protested sections in the sugar code declares that it shall be unfair competition:

....'for any carrier (whether by rail, water, truck, or otherwise, except a carrier over which the Interstate Commerce Commission exercises jurisdiction) by which sugar is shipped, to be owned by or in any way affiliated with any broker, buyer or warehouseman of sugar.'

"Automatically this would outlaw the broker, buyer, or warehouse-owned trucks which are not under the jurisdiction of the Commission, and would force the use of rail facilities.

"Under the stipulations of the code, sugar shall be sold only at delivered prices, which includes the refiners' base price, plus the all-rail freight rate, except where the Board of Directors of the Institute may permit otherwise, after consideration of a series of variables. Net, the result is to eliminate competitive transport as a factor in the reduction of sugar prices.

"A surcharge of three cents per hundred pounds, in addition to the all-rail freight rate, would be applied to purchases where buyers obtained their supplies by truck.

"All carriers, other than the refiner's own facilities or carriers under the jurisdiction of the Interstate Commerce Commission, would be licensed by the Agricultural Adjustment Administration in order to become eligible to transport sugar for the refineries. Such a requirement is absolutely unjustified and unwarranted under the terms of either the Recovery or Agricultural Adjustment Acts. The detailed requirements for eligibility would virtually eliminate all but common carriers. The net re-

sult would be to deal a death blow to the trucking of sugar.

"Benefits from any trucking arrangements finally possible under the Code would accrue to the refiner and not to the consumer."

Reports also have reached the Federal Truck Associations that moves are now being made under the steel code which would penalize the truck shipper. In the Cleveland area steel mills are said to be adding a surcharge of 35 per cent of the rail rate for loading trucks, in addition to the rail freight which is included in the delivered price under the steel "basing point" plan.

"Delivered price" provisions appear in the cement code and are under the scrutiny of the Federated Truck Associations.

Without attempting to prejudge the possible merit in the public interest of a "stabilized" price structure, the Federated Truck Associations point out that the new "basing points" are simple a revival of the old "Pittsburgh plus" plans, with the difference that in their opinion the present practice strikes at an efficient method of transportation, while the public pays the bill.

Bundy Tubing Moves

DETROIT—Bundy Tubing Company, manufacturers of metal tubings, has moved from Warren and Bellevue Aves., to 10951 Hern Ave., Detroit.

Gasoline Consumption Drops 3.6 Per Cent

NEW YORK—Gasoline consumption in June amounted to 1,507,831,000 gallons as compared with 1,368,-

987,000 in May and 1,532,927,000 in June a year ago, according to figures released by the American Petroleum Institute. This represents a gain over May of approximately 10 per cent and a loss as compared with June, 1932, of about 1.8 per cent.

For the first six months, consumption amounted to \$7,215,375,000 gallons, against 7,508,213,000 gallons last year, a loss of 3.6 per cent.

Auburn Six Months' Loss Is \$1,109,557

AUBURN, IND.—A net loss after depreciation, etc., of \$1,109,557 is reported by Auburn Automobile Co. for the six months ended May 31, 1933, compared with a loss of \$144,028 in the corresponding period a year ago. In the three months ending May 31, the loss was \$532,091 compared with a deficit of \$577,466 in the preceding three-month period and with \$151,987 loss in corresponding 1932 period.

Current assets on May 31, totaled \$9,862,294 and current liabilities \$477,259, making working capital \$9,205,035, as compared with working capital of \$11,732,289 a year earlier. Included in current assets are cash \$2,291,892 and U. S. securities \$2,200,000.

A Correction

The paper entitled "Reducing the Performance of a Solid-Injection Diesel Engine to Standard Conditions," by Professor A. H. Everett, an abstract of which appeared in our issue of Sept. 9, was presented at the recent National Oil and Gas Power Meeting of the American Society of Mechanical Engineers at Atlantic City. Credit to the Oil and Gas Power Division of the A. S. M. E. was inadvertently omitted.

CALENDAR OF COMING EVENTS

SHOWS

Eastern States Exposition, Springfield, Mass.	Sept. 17-23
National Metal Congress & Exposition Detroit	Oct. 2-6
Automotive Service Industries Show, M.E.M.A., N.S.P.A., M.E.W.A., Chicago	Oct. 30-Nov. 4
New York Automobile Show,	Jan. 6-13, 1934
Chicago Automobile Show,	Jan. 27-Feb. 3, 1934

CONVENTIONS

Nat. Assoc. of Motor Bus Operators, Chicago	Sept. 21-22
National Metal Congress, Detroit	Oct. 2-6
National Battery Manufacturers' Association, Chicago	Oct. 19-21

MEETINGS

American Transit Assoc., Chicago,	Sept. 18-20
National Petroleum Assn., Annual, Atlantic City	Sept. 20-22
Natl. Safety Council, Chicago	Oct. 2-6
National Metal Congress, Detroit	Oct. 2-6
A.S.M.E. Meeting, Detroit, Wednesday,	Oct. 4
American Petroleum Institute, Annual, Chicago	Oct. 24-26
Commercial Motor and Transport Vehicle Exhibition, London, England	Nov. 2-11
International Automobile Salon, Paris, France	Oct. 5-16
International Automobile and Motor-boat Show, London, England,	Oct. 12-21



"We've got our machining problem licked with *this* gear steel"

MACHINABILITY in gear steel is a subject to which Bethlehem metallurgists have devoted intensive effort. No stone is left unturned in the endeavor to increase the number of "gears per

grind" on the generator. To many users of Bethlehem Nickel-Molybdenum Gear Steel the development work that we have carried out along these lines has brought gratifying results.

If you are looking for improved machinability in gear steel, we are in position to cite facts and figures worthy of your serious consideration. *Bethlehem Steel Company, Bethlehem, Pa.*



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